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THE GROUND WAVE EMERGENCY NETWORK (GWEN) IS A RADIO COMMUNICATION SYSTEM DESIGNED TO RELAY EMERGENCY MESSAGES BETWEEN STRATEGIC MILITARY AREAS IN THE CONTINENTAL UNITED STATES.

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NAME OF ACTION: GROUND WAVE EMERGENCY NETWORK
NORTHWESTERN INDIANA RELAY NODE

DESCRIPTION OF PROPOSED ACTION ALTERNATIVES:

The U.S. Air Force plans to construct a radio communications relay node in northwestern Indiana (White County) as part of the Ground Wave Emergency Network (GWEN) communications system. Five action alternatives associated with five candidate GWEN sites (CGSs) in northwestern Indiana and the no action alternative have been considered and evaluated in an environmental assessment (EA).

GWEN is a radio communications system designed to relay emergency messages between strategic military areas in the continental United States. The system is immune to the effects of high-altitude electromagnetic pulse (HEMP) energy surges caused by nuclear detonations in the ionosphere that would disrupt conventional communications equipment. A failure of such equipment would prevent timely communications among top military and civilian leaders and strategic Air Force locations and prevent U.S. assessment and retaliation during an attack. GWEN is an essential part of a defense modernization program to upgrade and improve our nation's communications system, thereby strengthening deterrence.

The GWEN system is a network of relay nodes, receive-only stations, and input/output stations. The relay node in northwestern Indiana would be part of the Final Operational Capability (FOC) phase of the GWEN system and would establish essential links with adjacent nodes in the network.

In September 1987, the U.S. Air Force Electronic Systems Division, Hanscom Air Force Base, Massachusetts published a Final Environmental Impact Statement (FEIS) for the GWEN FOC that addressed the system as a whole and identified expected environmental effects common to all sites. Section 5 of the FEIS described a siting process that is designed to minimize the potential for environmental impacts. This process has three distinct phases: network definition, regional screening, and individual site evaluation. Network definition identified the need for a relay node in northwestern Indiana. Regional screening resulted in the identification of five CGSs in northwestern Indiana that met the exclusionary and evaluative criteria described in that FEIS. Individual site evaluation examined the relative suitability of the CGSs through site-specific technical studies. The EA is a part of the third phase and is tiered from that FEIS. It addresses the potential environmental effects of the five action alternatives and the no action alternative.

The proposed relay node in northwestern Indiana will be an unmanned facility located on approximately 11 acres of land and, once constructed, will resemble an AM radio broadcast station. The facility will consist of a 299-foot-tall, low-frequency (LF) transmitter tower, three equipment shelters, an access road, and associated fences. The tower will be supported by 24 guy wires, including 12 top-loading elements. An equipment shelter at the tower base will contain an antenna tuning unit. An 8-foot-high chain link fence topped with barbed wire will surround the tower base and associated equipment shelter. A radial ground plane, composed of 100, 0.128-inch-diameter copper wires buried about 12 inches underground, will extend out about 330 feet from the tower base. A 4-foot-high fence will be installed around the perimeter of the copper radials.

A second equipment area located at the site perimeter will contain two shelters housing a back-up power group (BUPG) with two internal fuel storage tanks and radio processing equipment. The BUPG will operate during power outages and for testing purposes. An LF receive antenna, consisting of a pair of 4-foot-diameter rings mounted on a 10-foot pole, and an ultrahigh-frequency (UHF) antenna, used for communicating with airborne input/output terminals and consisting of a 9-foot-high whip-like antenna mounted on a 30-foot-high pole, will also be located in this area. An 8-foot-high chain link fence topped with barbed wire will enclose the entire equipment area. A 10-foot-wide gravel road will connect this area to the tower base. A 12-foot-wide gravel road will provide access to the site from a public road.

The station will use existing commercial three-phase electric power and telephone service. Power and telephone service will be brought to the site through either overhead or buried lines, depending on local utility practices. In its ready status, the antenna will transmit in the LF radio band at 150 to 175 kilohertz for a total of 6 to 8 seconds per hour.

All of the five action alternatives are discussed in this Finding of No Significant Impact (FONSI).

ANTICIPATED ENVIRONMENTAL EFFECTS

The EA evaluated potential impacts to the physical, biological, and socio-cultural environment from construction and operation of the relay node.

The project would have no significant impacts on physical resources. Erosion and increased runoff would be minimized by using proper erosion control techniques during construction and by replanting the site afterwards. Impacts to mineral resources would be minor. Paleontological resources are not likely to occur on any of the sites; therefore significant impacts to them are not anticipated. A maximum of 11 acres of prime farmland would be removed from production. Water quality would not be significantly affected because increases in copper concentrations due to corrosion of the ground plane would be negligible. Air quality would not be significantly affected. During construction, temporary and insignificant increases in emissions would occur, and during operation, emissions from the BUPG would not be sufficient to result in violation of air quality standards.

The project would have no significant impacts on biological resources. The sites are located on farmland and do not contain sensitive wildlife habitat. There would be no significant impacts on wetlands and no CGS is within a 100-year floodplain. Informal consultation with the U.S. Fish and Wildlife Service and the Indiana Department of Natural Resources, Division of Fish and Wildlife, indicated that the project is not likely to adversely affect any federal or state threatened or endangered species. Bird-tower collisions may occur but would not be significant because the tower would be located away from primary bird habitats and migratory routes.

The project would have no significant impacts on socio-cultural resources. Construction would have a small, beneficial impact on the local economy, in part by providing temporary employment for contractors and construction workers. Community support systems would not be significantly affected. Land use and noise impacts would not be significant. The relay node signal would not interfere with commercial television or radio broadcasts, amateur radio operations, garage door openers, or pacemakers. Radio-frequency emissions outside the fenced area around the tower base would not pose a health hazard to humans or animals. The Indiana Department of Natural Resources, Division of Historic Preservation and Archaeology, was consulted and concurred that the project would not affect significant cultural resources. Significant impacts to Native American traditional, religious or sacred sites are not anticipated. A visual analysis conducted in accordance with the criteria developed in the FOC FEIS concluded that the relay node facility would not cause significant visual impacts.

CONCLUSIONS:

No significant impacts to the surrounding environment would be caused by construction and operation of the proposed relay node on the Leader (CGS-11), Ratcliff, (CGS-12), Sanbloom (CGS-26), Ward (CGS-33), or Lehe (CGS-36) site. Therefore, an environmental impact statement for a GWEN relay node at the cited locations in northwestern Indiana is not required.

for

David O. Williams, Colonel, USAF
Chairman
HQ ESC Environmental Protection Committee

25 Mar 93
Date

PREFERRED GWEN SITE REPORT
NORTHWESTERN INDIANA

The U.S. Air Force is proposing to construct a relay node for the Ground Wave Emergency Network (GWEN) in Northwestern Indiana. The Air Force has followed the siting process described in Section 5 of the Final Environmental Impact Statement (FEIS) for the Final Operational Capability (FOC) phase of the GWEN program to identify alternative Candidate GWEN sites (CGSs). The five CGSs identified in Northwestern Indiana are referred to as the Leader site (CGS-11), Kelly site (CGS-12 and formerly known as the Ratcliff site), Sanbloom site (CGS-26), Ward site (CGS-33) and the Lehe site (CGS-36).

This Preferred GWEN Site Report (PGSR) summarizes the process of selecting the preferred site from among the five CGSs. This PGSR, along with a site-specific Environmental Assessment (EA) and Finding of No Significant Impact (FONSI), is being distributed for information and comment in compliance with the Air Force's process of Interagency and Intergovernmental Coordination for Environmental Planning (IICEP).

Operational, environmental, and developmental suitability; construction and real estate acquisition costs; and public comments and concerns are all factors which have been considered in arriving at the selection of the preferred site.

Without an **operationally suitable** location, connectivity of the relay node in Northwestern Indiana to the GWEN network cannot be achieved. Ground conductivity measurements are acceptable at all five sites. During site-specific studies, no radio frequency interference was detected in GWEN frequency bands which would interfere with the operation of the GWEN receiver. Also, operations at either site would pose no interference with other known systems. All sites are operationally suitable.

The next major factor considered in selecting the preferred site is **environmental suitability**. The environmental suitability of each CGS was determined from information provided by an independent field analysis and is documented in the EA. Based on the environmental analysis of each CGS, the Air Force has concluded that no significant environmental impacts would occur at either of the five sites. Therefore, all five sites are environmentally suitable.

Four CGSs are **suitable for development** as a GWEN relay node. The FAA has determined that construction of the GWEN relay node at the Ward site would be hazardous to navigation. **Construction cost** is lowest and varies only slightly between the Leader, Sanbloom and Kelly sites but is somewhat higher at the Lehe site primarily due to distance to the telephone connection point. Although, cost are lower at three of the sites, all four are developmentally acceptable.

The final consideration as to the preferred GWEN site is the **real estate acquisition**. The Air Force has obtained a lease option on the Leader sites. Negotiations for the Ward site were discontinued after the FAA determination. The Army Corps of Engineers were unable to reach mutually acceptable terms for the Kelly, Sanbloom and Lehe sites. Therefore, the Air Force has a lease agreement for the Leader site only.

With operational and environmental factors acceptable, and developmental factors and acquisition costs considered, the Air Force prefers the Leader site. The Leader

site is preferred because it ranks best overall among the previously mentioned criteria including environmental qualifications and acquisition (lease option signed) costs for otherwise qualified sites.

I therefore have selected the Leader site as the Air Force's preferred site for development as the GWEN relay node in Northwestern Indiana. After reviewing the information received during the IICEP process, I will prepare for construction of the relay node.

STEPHEN T. MARTIN, Lt Col, USAF
Program Manager, GWEN

4 June 93
(Date)

GROUND WAVE EMERGENCY NETWORK
FINAL OPERATIONAL CAPABILITY

ENVIRONMENTAL ASSESSMENT
FOR
NORTHWESTERN INDIANA RELAY NODE

SITE NO. RN 8C902IN

5 March 1993

Electronic Systems Center
Air Force Material Command, USAF
Hanscom AFB, Massachusetts 01731-1623

GROUND WAVE EMERGENCY NETWORK
FINAL OPERATIONAL CAPABILITY

ENVIRONMENTAL ASSESSMENT
FOR
NORTHWESTERN INDIANA RELAY NODE
SITE NO. RN 8C902IN

5 March 1993

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SUMMARY

The Ground Wave Emergency Network (GWEN) is a radio communication system designed to relay emergency messages between strategic military areas in the continental United States. The system is immune to the effects of high-altitude electromagnetic pulse (HEMP) energy surges caused by nuclear bursts in the ionosphere that would disrupt conventional communications equipment such as telephones and shortwave radios. A failure of such equipment would prevent timely communications among top military and civilian leaders and strategic Air Force locations and prevent U.S. assessment and retaliation during an attack. GWEN is an essential part of a defense modernization program to upgrade and improve our nation's communications system, thereby strengthening deterrence.

The GWEN system consists of a network of relay nodes, receive-only stations, and input/output stations. Each relay node, such as the one proposed in northwestern Indiana, consists of a guyed radio tower facility similar to those used by commercial AM broadcast transmitters.

A Final Environmental Impact Statement (FEIS) for the GWEN Final Operational Capability (FOC) was published in September 1987 by the Electronic Systems Division, Hanscom Air Force Base, Massachusetts. That FEIS addressed the GWEN system as a whole, identifying expected environmental effects common to all sites. Section 5, beginning on page 5-1 of the FEIS, describes a siting process that is designed to minimize the potential for environmental impacts. This process has three distinct phases: network definition, regional screening, and individual site evaluation.

Phase 1, network definition, identified the geographic coordinates that met the operational needs and technical constraints of the network. Each set of coordinates became the center of a circular site search area (SSA) with a 9-mile radius (250 square miles). The SSA discussed in this Environmental Assessment (EA) contains portions of White, Carroll, and Tippecanoe counties and was centered 0.4 mile west of the town of Brookston, in White County, northwestern Indiana, at latitude 40.60° N and

longitude 86.88° W. The principal towns in the SSA are Brookston, Chalmers, and Battle Ground.

Phase 2, regional screening, involved the application of exclusionary and evaluative criteria to the SSA to avoid environmentally sensitive areas. The remaining areas, called potential areawide sites (PAWS), became the focus of the siting process. The field investigation for northwestern Indiana was conducted in March 1990. Fifty-two sites were identified during automobile-based surveys as potential candidate GWEN sites (PCGSs). Fourteen sites, located in Carroll County between the Tippecanoe and Wabash rivers, were eliminated because of potential conflicts with recreational resources and avian wildlife. Attempts were made to contact the owners of the remaining sites to determine their interest in selling or leasing land to the Government. Rights-of-entry were granted to investigate ten PCGSs. Following evaluation against the environmental siting criteria set forth in the FEIS, five of the ten PCGSs were recommended as candidate GWEN sites (CGSs) for further review. All CGSs are located in White County. These CGSs were described in the Preliminary Site Evaluation Report (PSER) of May 15, 1990.

Phase 3, individual site evaluation, involves evaluating the relative suitability of the candidate sites through site-specific technical studies. This EA is a product of those evaluations and discusses the five siting alternatives in northwestern Indiana. It addresses only those criteria that apply to the candidate sites. The sixth alternative, no action, would impair performance of the GWEN system but leave the environment unchanged.

To be suitable for construction and operation, a site should measure at least 700 by 700 feet (approximately 11 acres), be relatively level and undeveloped, be free of natural or man-made obstructions, and have soils capable of supporting relay node structures. The site should also be close to all-weather roads, commercial three-phase power, and telephone lines to minimize costs. To operate effectively, the site must be located at least a minimum distance from obstructions that could affect reception and transmission. These include buildings and towers, high-voltage power

lines, and other communications systems or sources of radio-frequency interference. Specific minimum distances depend on height and power levels of identified obstructions or interfering sources.

This EA shows that construction and operation of a GWEN relay node would have no significant impacts if built on any of the five candidate sites. During the 6-week construction period, the project would cause temporary and insignificant air quality and noise impacts and slight increases in traffic. It would have a small, beneficial impact on the local economy, in part because it would provide temporary employment for contractors and construction workers. The project would have no significant impacts on air quality; water quality; land use; mineral resources; known paleontological resources; biological resources, including threatened and endangered species; or cultural resources that are listed, eligible, or potentially eligible for listing on the National Register of Historic Places. Visual impacts would not be significant. Radio-frequency emissions outside the fenced area around the tower base would not pose a health hazard to humans or animals.

1.0 PURPOSE AND NEED FOR ACTION

The proposed action covered by this Environmental Assessment (EA) includes construction and operation of a relay node of the Ground Wave Emergency Network (GWEN) in northwestern Indiana (see Figure 1.1 of this EA). This relay node will provide essential connections with adjacent nodes in the network. The major features of a GWEN relay node and associated environmental impacts common to all sites are addressed in the Final Environmental Impact Statement (FEIS) for the Final Operational Capability (FOC) phase of GWEN, which was published in September 1987 by the Electronic Systems Division, Hanscom Air Force Base, Massachusetts. This EA is tiered from that FEIS and addresses site-specific conditions at the candidate GWEN sites (CGSs) for this particular site search area (SSA).

The purpose of GWEN is to provide to the President and the National Command Authority a strategic communications network that is immune to the effects of high-altitude electromagnetic pulse (HEMP) and will carry critical attack warning and force execution data. As a result, GWEN will remove any possibility of potential aggressors taking advantage of the electromagnetic pulse generated by a high-altitude nuclear burst. A HEMP surge would disrupt the nation's electric power line transmission capability, cripple electronic devices, and adversely affect skywave communications networks based on conventional electronics. GWEN provides a low-frequency (LF) ground wave communication network that will not be affected by HEMP effects. It thereby strengthens deterrence by removing the option of beginning an attack against the United States by using HEMP effects.

A partial GWEN network, called the Thin Line Connectivity Capability (TLCC), has been completed. It contains 8 input/output stations, 30 receive-only stations, and 54 relay nodes. The TLCC provides a limited level of HEMP-protected communications to strategic forces and the National Command Authority.

The FOC phase of GWEN will add 29 relay nodes. The FOC will allow communication along several routes, thereby enhancing system availability and ensuring that vital communications will be maintained.

FIGURE 1.1 NORTHWESTERN INDIANA SITE SEARCH AREA (SSA), WHITE, CARROLL AND TIPPECANOE COUNTIES, INDIANA

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

The five action alternatives are site-specific applications of the standard relay node design presented in the FEIS. Consequently, they share a number of features that are discussed in Section 2.1 of this EA. The site-specific features are discussed in Sections 2.2 through 2.6 of this EA. Site descriptive data was obtained during a field investigation conducted in March 1990. Figure 2.1 of this EA shows the five CGSs in relation to the major features of the SSA. Figure 2.2 and Appendix B of this EA show the locations of the CGSs in relation to roads and surrounding topography, respectively.

2.1 Common Features of the Action Alternatives

2.1.1 Site Selection Process

The process used to select sites is described in Section 5, beginning on page 5-1 of the FEIS. This process has three distinct phases: network definition, regional screening, and individual site evaluation. Appendix A of this EA provides a diagram of the site selection process. The environmental criteria used in this process are defined in Tables 5-1 and 5-2, pages 5-7 through 5-14 of the FEIS.

Phase 1, network definition, involved locating network nodes to optimize their performance while serving a predetermined number of users. A typical GWEN ground wave has an effective range of about 150 to 200 miles. Thus, relay nodes could not be located independently; changing the location of one would affect the connectivity with other nodes in the network. Once the optimal coordinates of the relay nodes were identified, a 9-mile-radius SSA was defined around each point to provide suitable opportunity for siting a relay node near that point. The 9-mile radius was chosen because it provided a reasonably sized search area consistent with the technical constraints on the relay node. If a significant portion of an SSA fell within an environmentally highly sensitive area such as a national park or wilderness area, an alternative was selected and its connectivity evaluated. This process was repeated until all relay nodes fell outside such areas.

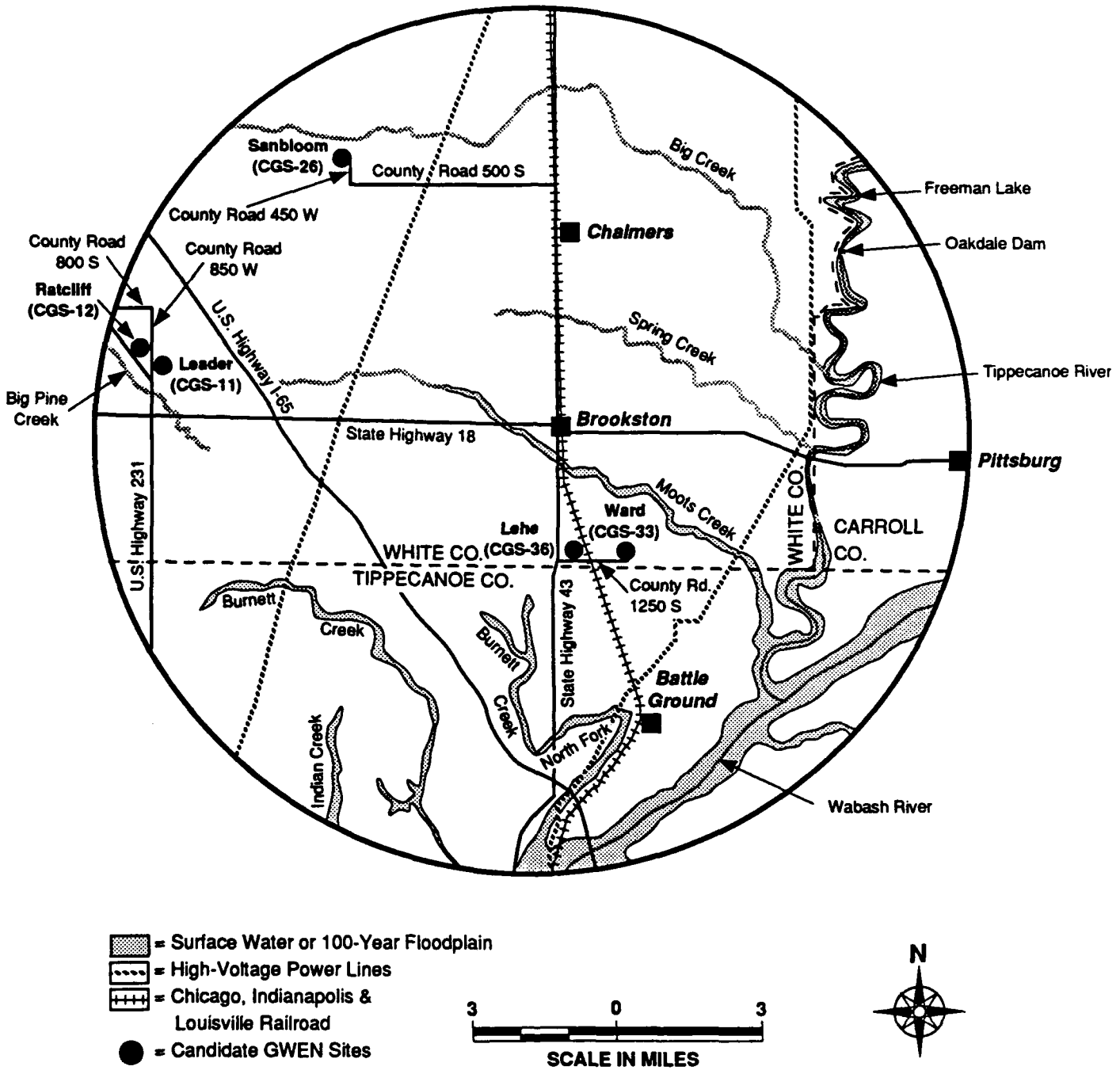

FIGURE 2.1 LOCATIONS OF CANDIDATE GWEN SITES (CGSs) RELATIVE TO SELECTED MAJOR FEATURES AND ROADS WITHIN THE NORTHWESTERN INDIANA SITE SEARCH AREA

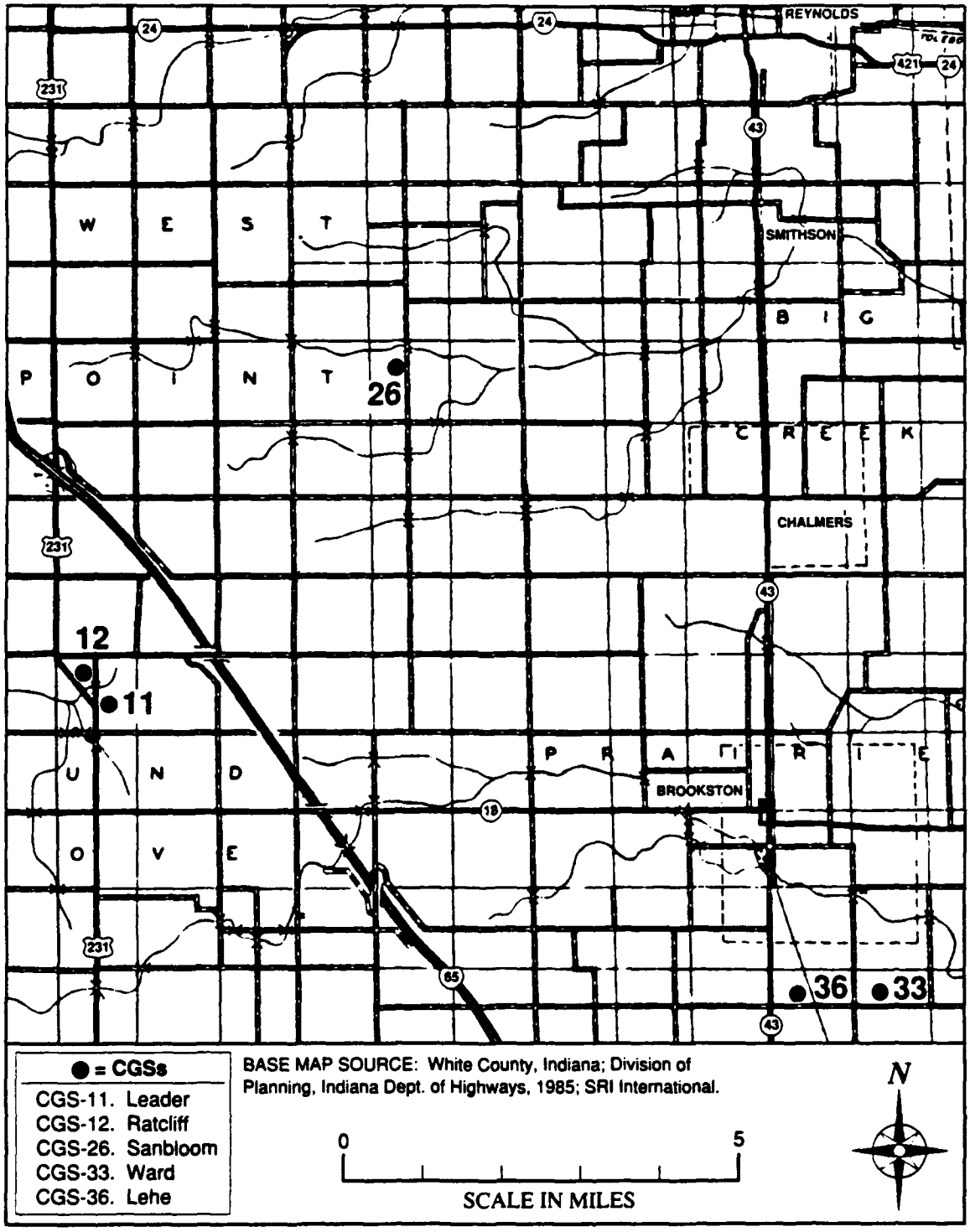

FIGURE 2.2 LOCATIONS OF CANDIDATE GWEN SITES (CGSs) IN WHITE COUNTY

Phase 2, regional screening, involved the application of exclusionary and evaluative criteria to the SSA to identify areas that might contain operationally acceptable sites outside environmentally sensitive areas. The resulting search areas, called potential areawide sites (PAWS), were submitted to appropriate federal, state, and local officials for review. The PAWS were then redefined, as appropriate, by incorporation of the comments of the reviewers, and a field investigation was conducted to find suitable candidate sites for a GWEN relay node within the redefined PAWS.

The field investigation for northwestern Indiana was conducted in March 1990. Fifty-two sites were identified during automobile-based surveys as potential candidate GWEN sites (PCGSs). Fourteen sites, located in Carroll County between the Tippecanoe and Wabash rivers, were eliminated because of potential conflicts with recreational resources and avian wildlife. Attempts were made to contact the owners of the remaining sites to determine their interest in selling or leasing land to the Government. Rights-of-entry were granted to investigate ten PCGSs. Following evaluation against the environmental siting criteria set forth in the FEIS, five of the ten PCGSs were recommended as CGSs for further review. All CGSs are located in White County.

Phase 3, individual site evaluation, of which this EA is a part, is then used to determine the relative suitability of the candidate sites through site-specific technical studies. This EA presents the results of the environmental portions of those studies and covers site-specific impacts associated with construction of a relay node in northwestern Indiana. These are summarized in Sections 4.2 through 4.6 of this EA. The findings of this EA and site-specific studies of operational parameters will be used to select a preferred GWEN site (PGS).

2.1.2 Relay Node Construction and Operation

A typical relay node site is located on approximately 11 acres of land (see Figure 2.3 of this EA). It is an unmanned facility consisting of a 299-foot-tall, three-sided, 2-foot-wide, low-frequency (LF) transmitter tower, three equipment shelters, an access road, and associated fences. The tower has a base insulator and lightning protection and is

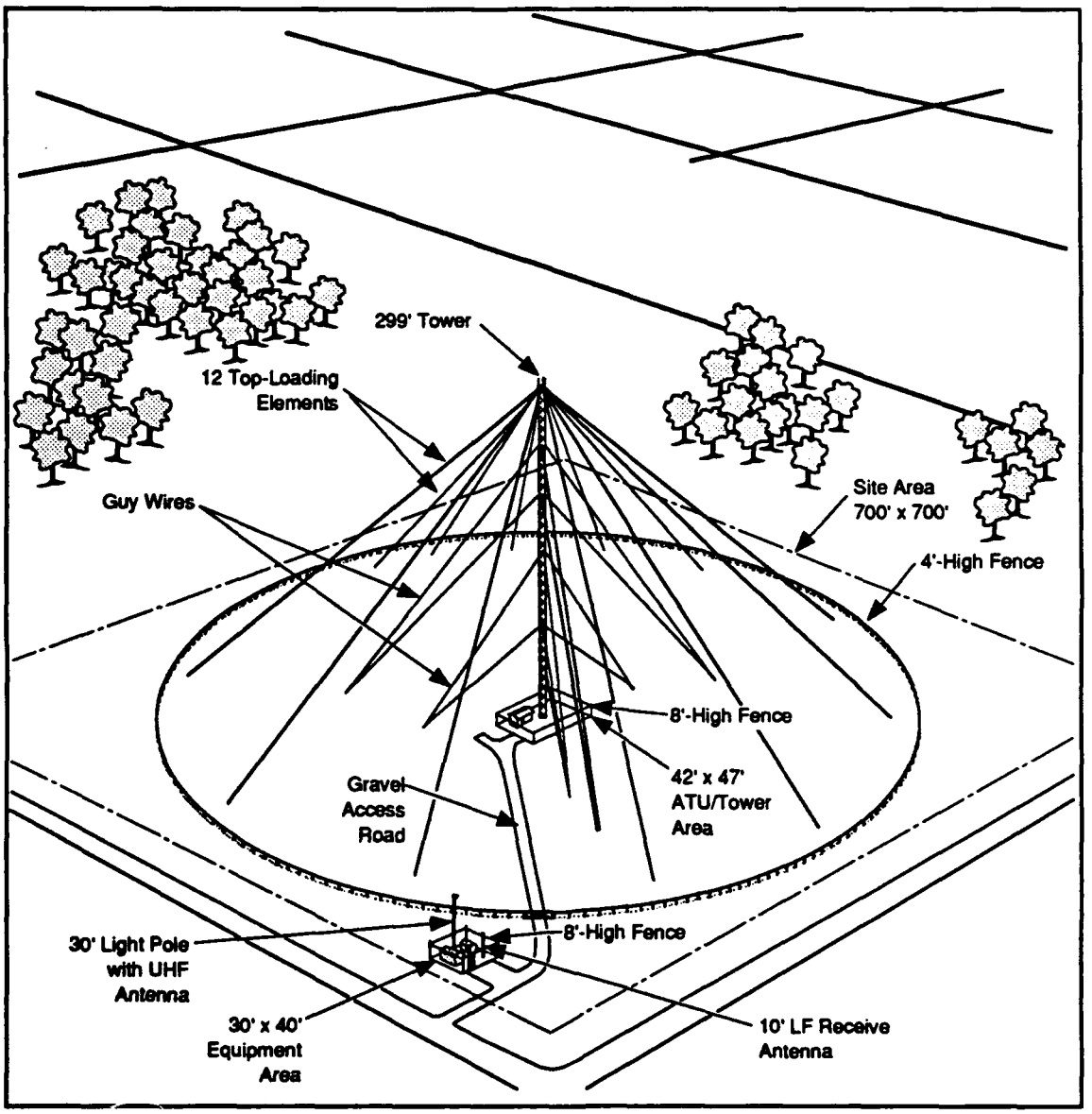

FIGURE 2.3 TYPICAL LAYOUT OF FOC RELAY NODE STATION

supported by 24 guy wires, including 12 top-loading elements to further strengthen the signal and provide additional structural support.

These guy wires and top-loading elements are attached to the tower and 18 buried concrete anchors. The sizes of these anchors and their depth of burial varies with local soil and bedrock properties. However, the guy-wire anchors typically are rectangular blocks buried 5 feet below the surface. If bedrock occurs at or near the surface, the anchors are special rock-embedded rods. The tower base is concrete with a cross-section area resembling an inverted T. The size of this foundation is determined by soil conditions.

A radial ground plane, composed of 100 buried copper wires, extends out from the base of the tower. Each wire is 0.128 inch in diameter, about 330 feet long, and buried approximately 12 inches underground. The ground plane helps to strengthen the broadcast signal, and the number and length of the wires depend on the soil conductivity at the site. A 4-foot-high fence is installed around the perimeter of the ground plane to protect the ground plane and guy anchors and to prevent inadvertent exposure to electric shock resulting from the buildup of static electric charge.

In addition to the main tower, the relay node has two other antennas. One is an LF receive antenna made up of a pair of 4-foot-diameter rings mounted on a 10-foot pole. The second is an ultrahigh-frequency (UHF) antenna used for communicating with airborne input/output terminals. It is a 9-foot-high whip-like antenna mounted on a 30-foot-high pole. Both antennas are located within the equipment area at the perimeter of the site, which is enclosed by an 8-foot-high fence.

The siting and design of the tower are coordinated with the Federal Aviation Administration (FAA) to ensure compliance with FAA standards and regulations. The tower is equipped with a white strobe light at the top, which emits 40 flashes per minute and is rated at 20,000 candelas for daytime and twilight use and 2,000 candelas for nighttime use. To minimize glare at ground level, the light is focused upward and horizontally outward.

GWEN operates intermittently in the LF radio band at 150 to 175 kilohertz (kHz). For comparison, the low end of the AM band for commercial broadcasts is 530 kHz. The peak broadcast power for each GWEN tower is from 2,000 to 3,000 watts, depending on local soil conditions. In its ready status, GWEN typically transmits for a total of 6 to 8 seconds per hour. GWEN does not interfere with commercial television, radio broadcasts, amateur radio operations, garage door openers, or pacemakers, as discussed in Section 2.1.1.1, page 2-3 of the FEIS.

All equipment shelters are anchored to concrete pads. One shelter, located at the base of the tower, houses the antenna tuning unit (ATU). Two other shelters are located side by side in the equipment area enclosed at the perimeter of the property. One houses radio-processing equipment, and the other houses a 70-horsepower, back-up diesel generator and two aboveground fuel tanks. The generator operates 2 hours per week for testing purposes and during power outages. Locked, 8-foot-high chain link fences topped with barbed wire secure the equipment shelter areas at the base of the tower and at the perimeter of the site to provide safety and to inhibit unauthorized entry. A 12-foot-wide gravel road provides access to the equipment area enclosure at the perimeter of the property. A 10-foot-wide gravel road leads from the equipment enclosure to the tower.

Fuel is stored in two aboveground steel tanks inside the generator shelter. Tank capacities are 559 gallons and 461 gallons. Each tank pipes fuel separately to the back-up power group (BUPG) and is equipped with two outlet shut-off valves, one controlled manually and one controlled automatically. If a leak occurs, fuel will flow into a floor drain leading to a tightly capped pipe extending outside the BUPG. Once approximately 2 gallons of fuel accumulate in the pipe, a "liquid spill" signal is sent to the GWEN Maintenance Notification Center, which will dispatch maintenance personnel. However, if a leak were not detected, an explosion inside the shelter would be extremely unlikely due to the high flash point of diesel fuel. If a tank at the GWEN station failed, the entire contents of one tank could be released and contained inside the BUPG enclosure. Refer to Section 4.12.1.1, beginning on page 4.12-1 of the FEIS for further discussion on diesel fuel spills and leaks.

The station uses existing commercial three-phase electric power and telephone service, but does not require water, septic, or sewer systems. Power and telephone service are brought to the site through either overhead or buried lines depending on local utility practices. Power and telephone service are generally brought underground from the site boundary to the equipment shelter area.

Temporary increases in air pollutant emissions will occur during construction, primarily from greater use of heavy machinery than is required in normal farming operations. Emissions resulting from operations of the facility will be limited to the operation of the BUPG, which will operate only 2 hours every week for testing purposes and for additional periods as required during power outages. Thus, the generator will operate for a total of 152 hours per year, if commercial power outages totaled 48 hours. If the generator runs at 100 percent load during the projected 152-hour operating time, total emissions in one year will be less than 350 pounds per pollutant, as documented in Section 4.3.1, beginning on page 4.3-1 of the FEIS.

Noise levels generated by construction equipment are discussed in Section 4.5.1.1, beginning on page 4.5-1 of the FEIS. Under worst-case assumptions, levels could reach 78 dBA at the site boundary from on-site activity and 92 dBA at distances of 50 feet from equipment installing the off-site access road. Noise generated during GWEN operation would come from the BUPG, which will operate only 2 hours per week and during commercial power outages. The BUPG will be located at least 50 feet within the site boundary with its exhaust side oriented toward the tower area. Noise levels due to intermittent operation of the BUPG will be less than 72 dBA at the site boundary, which is within the standards typically set for lands under agricultural use (70 to 75 dBA). At 50 feet beyond the site boundary, the noise level would drop below 65 dBA, which is within the standards typically set for residential and mixed residential/agricultural use (55 to 65 dBA). These noise levels and standards are discussed in Section 3.5.3, page 3.5-2 and Section 4.5.1, pages 4.5-1 through 4.5-6 of the FEIS.

Construction will require as many as 20 workers at any given time and take about 6 weeks. Standard earth-moving and erection equipment will be used, as detailed in Table 2-1, page 2-14 of the FEIS. Erosion control techniques that are consistent with local practices will be used during construction. Grading and vegetation removal will be minimal on the site and along the access road. The site will be replanted after construction is finished.

After construction is completed, personnel requirements will be limited to periodic maintenance by a contractor who will service the equipment, cut the surface growth, remove snow from the access road, and perform other services as needed. Security services will be arranged with local authorities. The projected life of the facility is 15 to 25 years. Upon decommissioning, the tower and other structures will be removed, as discussed in Section 2.1.4, page 2-18 of the FEIS.

2.2 Alternative 1: Leader Site (CGS-11)

The Leader site is located in the northwest quarter of the southeast quarter (NW1/4 SE1/4) of Section 7, Township 25N, Range 5W, Round Grove Township, on the east side of U.S. Highway 231. This site is adjacent to and east of the intersection of County Road 850W and U.S. Highway 231. A 15-foot access road would be constructed from County Road 850W.

Three-phase power would be obtained from overhead lines adjacent to the site's western boundary. Telephone service would be connected to an underground cable located on the west side of U.S. Highway 231, 45 feet west of the site.

Appendix B, Figure B.1 of this EA, provides a map showing the surrounding topography.

2.3 Alternative 2: Ratcliff Site (CGS-12)

The Ratcliff site is located in the SE1/4 NW1/4 of Section 7, Township 25N, Range 5W, Round Grove Township, on the east side of U.S. Highway 231. This site is bounded by County Road 850W on the east and U.S. Highway 231 on its southwest corner. County Road 800S lies 1,500 feet to the north. A 15-foot access road would be constructed from County Road 850W.

Three-phase power would be obtained from overhead lines located on the east side of County Road 850W, 50 feet east of the site. Telephone service would be connected to an underground cable located on the west side of U.S. Highway 231, 110 feet southwest of the site.

Appendix B, Figure B.2 of this EA, provides a map showing the surrounding topography.

2.4 Alternative 3: Sanbloom Site (CGS-26)

The Sanbloom site is in the SE1/4 NW1/4 of Section 23, Township 26N, Range 5W, West Point Township, on the west side of County Road 450W. A 10-foot access road would be constructed from County Road 450W.

Three-phase power would be obtained from overhead lines located on the east side of County Road 450W, 35 feet east of the site. Telephone service would be connected to an underground cable located on the east side of County Road 450W, 35 feet east of the site.

Appendix B, Figure B.3 of this EA, provides a map showing the surrounding topography.

2.5 Alternative 4: Ward Site (CGS-33)

The Ward site is located in the SE1/4 NW1/4 of Section 35, Township 25N, Range 4W, Prairie Township, on the north side of County Road 1250S. A 10-foot access road would be constructed from County Road 1250S.

Three-phase power would be obtained from overhead lines located adjacent to the southern boundary of the site. Telephone service would be connected to an underground cable located on the west side of County Road 100E, 1,990 feet west of the site.

Appendix B, Figure B.4 of this EA, provides a map showing the surrounding topography.

2.6 Alternative 5: Lehe Site (CGS-36)

The Lehe site is located in the SE1/4 NW1/4 of Section 34, Township 25N, Range 4W, Prairie Township, on the north side of County Road 1250S. It is approximately 1,900 feet from State Highway 43 and comes within 50 feet of the Chicago, Indianapolis and Louisville Railroad right-of-way. A 13-foot access road would be constructed from County Road 1250S.

Three-phase power would be obtained from overhead lines adjacent to the southern border of the site. Telephone service would be connected to an underground cable located on the west side of State Highway 43, approximately 1,960 feet west of the site.

Appendix B, Figure B.5, of this EA provides a map showing the surrounding topography.

2.7 No Action Alternative

The no action alternative is deletion of the northwestern Indiana relay node from the GWEN network. Adoption of this alternative would mean a consequent degradation in the performance of the system due to a lack of connectivity to other nodes in the system.

3.0 AFFECTED ENVIRONMENT

This section discusses the environmental setting of the proposed GWEN project in northwestern Indiana. Section 3.1 of this EA describes the general characteristics of the SSA, and Sections 3.2 through 3.6 of this EA describe the unique characteristics of each CGS within the SSA. Site descriptive data was obtained during field investigations conducted in March 1990. U.S. Geological Survey 7.5 minute topographical maps were used as data sources for distances, physiographic features, and topography (USGS, 1962 a-f, 1979, 1980 a-b, 1988).

3.1 Site Search Area

Presented below is information on the physical, biological, and socio-cultural settings of the SSA.

3.1.1 Physical Setting

The SSA in northwestern Indiana is a circular, 250-square-mile area in White, Carroll, and Tippecanoe counties, centered 0.4 mile west of the town of Brookston, in the Central Lowlands physiographic province of the United States. Its terrain is characterized as young till plains with very few lakes and few moraines. Landforms range from rolling hills to generally level topography. Local relief is generally less than 20 feet; gradients are less than 10 percent and commonly are 1 to 2 percent.

The SSA is underlain by sedimentary rocks of the Paleozoic era (245 to 570 million years ago), which occur at depths of greater than 60 feet and do not surface in the area. The overlying glacial till is generally silty and level. The broad, level uplands of the SSA are bordered on the east by the valleys of the Tippecanoe and Wabash rivers.

Seismic activity in the SSA is relatively low (Manitakos, 1989). There are no known faults in the vicinity that have exhibited displacement in the last 15 million years. However, several earthquakes have been recorded within 100 miles of the SSA in the

last 150 years, ranging from intensities of II to V on the Modified Mercalli (MM) intensity scale. Earthquakes with an MM intensity of V or less are not severe enough to cause property damage, although they are noticeable, especially to people indoors. The strongest earthquake recorded in Indiana history, MM intensity VII, occurred in 1909 over 60 miles from the SSA in the Wabash Valley and damaged chimneys and plaster (Howard *et al.*, 1979; Stover, 1986; Stover *et al.*, 1987). Well-built structures founded on solid geologic materials (i.e., bedrock, consolidated alluvium, or compacted fill) would be subject to extremely low risks from seismic activity (Manitakos, 1989).

There are no known mineral or energy resources in the SSA, although the SSA contains a few abandoned quarries which are presently filled with water (Cronch, 1990a).

Significant paleontological resources are rare due to the history of glaciation in the SSA, so these resources are unlikely to be found on any of the sites. Moreover, the bedrock beneath the area is not located near the surface and is not considered a likely source of paleontological finds (Rexroad, 1990). Areas in the SSA that have potential for paleontological resources include marshes, bogs, and areas immediately adjacent to quarries. None of the CGSs contains marshes or bogs, and no quarries are located in the vicinity of the CGSs.

The soils of the SSA are silty, formed from glacial till. The CGSs are located on deep, poorly drained soils with low to moderate shrink-swell potential and slow to moderate permeability. The erosion hazard due to wind and water is very slight, as surface runoff tends to be very slow. As a result, water tends to pond on most of the soils of the SSA during periods of high precipitation. The seasonal groundwater table has a depth of +0.5 to 3 feet during the period of heavier rains from December to May on all of the soils of the CGSs except the Martinsville and Montmorenci soils of the Ward site (CGS-33), which have a water table of greater than 3 feet. Soils on the CGSs range from neutral to very strongly acidic (pH 7.3 to 4.5). Martinsville soil (CGS-33) is designated prime farmland; all of the other soils on the CGSs are designated prime farmland only if drained (SCS, 1978). There is at least one hydric soil type on each

CGS (SCS, 1987). The specific soils on each CGS are discussed in Sections 3.2 to 3.6 of this EA.

The principal watercourses that traverse the SSA are the Tippecanoe and Wabash rivers. The Tippecanoe River flows north to south along the eastern boundary of the SSA and empties into the Wabash River in the southeastern portion of the SSA. The major tributaries of the Tippecanoe River include Big Creek, Spring Creek, and Moots Creek. The Wabash River flows northeast to southwest along the southeastern boundary of the SSA. Tributaries that empty into the Wabash River include Burnett Creek and Indian Creek. All of these drainages are perennial and have steep banks and broad floodplains. None of the CGSs is located between the Tippecanoe and Wabash rivers nor are any CGSs located within 3.2 miles of either river. None of the CGSs lies within the 100-year floodplains of these rivers and streams (FIA, 1978; FIA, 1981a; FIA, 1981b). Outside the stream corridors, surface runoff tends to be very slow, and numerous shallow depressions collect and retain runoff resulting in saturated soils and ponding. The distances from each CGS to the nearest surface water or wetlands are given in Sections 3.2 through 3.6 of this EA.

Groundwater is the principal source of drinking water in the SSA. Wells vary in depth from 80 feet to as much as 250 feet (Banes, 1990). There are very few gravel wells in the area; most wells access groundwater from limestone, slate, or shale aquifers. As a result, some areas have experienced problems with insufficient groundwater recharge. The relatively impermeable soils characteristic of southern White County help to restrict groundwater recharge in the vicinity of the CGSs (Bayon, 1990). Water quality is good in southern White County because relatively impermeable soils render groundwater resources less susceptible to contamination (McDaniel, 1990a). Water quality of surface waters in the SSA is generally good, according to recent data from monitoring stations along the Tippecanoe River in White County (Winters, 1990a).

The climate of the SSA is characterized by cold winters and hot summers. Temperatures range from an average of 29°F in the winter to an average of 73°F in the summer. The average daily minimum temperature during winter is 21°F and the average daily maximum temperature during summer is 85°F. Total annual

precipitation is 37 inches. Approximately 60 percent of this precipitation falls from April through September, which includes the growing season for most crops. Thunderstorms occur about 45 days each year, and most occur during summer. Winter precipitation is primarily snow and provides an adequate supply of moisture in spring to minimize drought in summer. The average seasonal snowfall is 21 inches. The greatest snow depth recorded in White County is 16 inches. The prevailing wind is from the southwest, and the average wind speed is highest in March, at 12 miles per hour. Tornados and severe thunderstorms occur occasionally. These storms are usually local and of short duration and cause damage in a variable pattern (SCS, 1978).

Air quality in the area is good and does not exceed the National Primary and Secondary Ambient Air Quality Standards, which have been adopted by the State of Indiana (326 Indiana Administrative Code [IAC] 1-3-4). No air quality non-attainment areas or Class I Areas are located in White, Tippecanoe, or Carroll counties (Griffin, 1990). Air quality standards are discussed in Section 3.3.3, pages 3.3-1 to 3.3-7 of the FEIS.

3.1.2 Biological Setting

The lowland portion of northwestern Indiana was covered by tall grass prairie in presettlement times. Only remnants of the prairie remain, mostly in railroad right-of-ways and abandoned pioneer cemeteries. The original prairie vegetation was predominantly bluestem prairie, whose dominant species included big bluestem, little bluestem, switchgrass, and Indian grass. Oak-hickory forest was the original vegetation type near the rivers and large streams of the SSA. Principal dominant species of that plant community include bitternut hickory, shagbark hickory, white oak, red oak, and black oak (Küchler, 1964).

Today there are few undisturbed natural areas within White County as most of the land is used for agriculture. Examples of common grasses and legumes in the county include fescue, timothy, orchardgrass, bromegrass, bluegrass, clover, lespedeza, and alfalfa. Wild herbaceous plants found in White County include goldenrod

beggarweed, wheatgrass, ragweed, pokeweed, and dandelion. Hydrophytic plants commonly found in remnant wetlands in the county include smartweed, pondweed, wild millet, cordgrass, rushes, sedges, and reeds. Forested areas are primarily confined to the broad floodplains of the Tippecanoe and Wabash rivers and their tributaries in the eastern and southeastern portions of the SSA. Remnant patches of oak-hickory forest are scattered throughout the SSA, among the farmed parcels (SCS, 1978).

Common wildlife found in cropland, pasture, meadows, and overgrown areas of White County includes bobwhite quail, ring-necked pheasant, mourning dove, eastern meadowlark, field sparrow, red-tailed hawk, American kestrel, northern harrier, cottontail rabbit, red fox, and woodchuck. Examples of wildlife commonly found in woodland areas in White County include wild turkey, ruffed grouse, American woodcock, Cooper's and sharp-shinned hawks, thrushes, woodpeckers, squirrels, gray fox, raccoons, and white-tailed deer. Wetland plant communities in White County support duck, goose, shorebird, rail, kingfisher, muskrat, mink, and beaver populations (Robbins *et al.*, 1983; SCS, 1978).

The *Federal Manual for Identifying and Delineating Jurisdictional Wetlands* (GPO 1989-236-985/00336) states that an area must meet three criteria to be designated as wetland: hydric soils; hydrophytic vegetation; and wetlands hydrology, which includes a shallow water table and standing water for at least 7 days of the growing season (FICWD, 1989). This manual was used as the basis for wetland determination. Prior to the turn of the century, wetlands were widespread in the SSA. However, most were drained for agriculture prior to the passage of the Clean Water Act in 1977, except in areas set aside for groundwater recharge. Lands drained for agricultural use prior to the Clean Water Act of 1977 are not considered federal jurisdictional wetlands by the U.S. Army Corps of Engineers. Clay drainage tiles installed prior to 1977 underlie all the soils in the CGSs, thereby altering the soil hydrology (Wagner, 1990). Based on National Wetlands Inventory maps (USFWS, 1987), soils data (SCS, 1978; SCS, 1987), and a recent wetlands survey of all of the sites by the Soil Conservation Service (SCS), the Ward site (CGS-33) is the only CGS that contains wetlands. The other four sites do not contain wetlands nor are they within 300 feet of wetlands (SCS,

1991). The U.S. Army Corps of Engineers concurs with this determination (Shelton, 1991a; Shelton, 1991b).

No wildlife refuge areas protected by federal and state conservation authorities exist within the SSA. However, waterfowl and other avian species of the area use the corridors of the Tippecanoe and Wabash rivers for local and regional migration. For this reason, the Division of Fish and Wildlife of the Indiana Department of Natural Resources considers the lands in the SSA between the Tippecanoe and Wabash rivers to be potentially sensitive with regard to bird-tower collisions (Sporre, 1990).

In compliance with Section 7 of the Endangered Species Act of 1973, as amended (16 United States Code [USC] 1531, *et seq.*, at 1536), a list of threatened and endangered species was requested during informal consultation with the U.S. Fish and Wildlife Service (USFWS). The USFWS determined the SSA was within the range of three threatened and endangered species and seven candidate species (Appendix C, Hudak, 1990, pages C-4 and C-5 of this EA). Further consultation with the USFWS, subsequent to the selection of the CGSs, determined that only the bald eagle (*Haliaeetus leucocephalus*) and the Indiana bat (*Myotis sodalis*) may potentially occur near the CGSs (Appendix C, Hudak, 1990 , 1992, pages C-6 to C-7, C-13, and C-14 of this EA).

The bald eagle is a winter transient in Indiana. A pair nested and produced a chick in the state last year for the first time in over a century. No prime potential nesting sites are located within the SSA. The only large water resources that are potential nesting and/or foraging areas are the Tippecanoe and Wabash rivers and Freeman Lake (Appendix C, Hudak, 1990, pages C-4 and C-5 of this EA).

The Indiana bat hibernates in caves in southern Indiana during winter and disperses throughout the state to reproduce and forage during spring and summer. The preferred reproductive habitat of this endangered species includes moderate-sized, relatively undisturbed expanses of diverse mixtures of floodplain forest and upland forest (Appendix C, Hudak, 1990, pages C-4 and C-5 of this EA). Such habitat is present in the SSA only between the Tippecanoe and Wabash rivers.

Indiana state-listed endangered or threatened animal species potentially occurring throughout the SSA include ten birds, one mammal, and six plant species (Huffman, 1990). The birds include the eastern greater sandhill crane (*Grus canadensis tabida*), upland sandpiper (*Bartramia longicauda*), northern harrier (*Circus cyaneus*), king rail (*Rallus elegans*), black tern (*Chlidonias niger*), osprey (*Pandion haliaetus*), bald eagle (*Haliaeetus leucocephalus*), peregrine falcon (*Falco peregrinus*), black-crowned night heron (*Nycticorax nycticorax*) and the common barn owl (*Tyto alba*). The one mammal is the badger (*Taxidea taxus*). The plants include two shrubs: the scarlet hawthorn (*Crataegus pedicellata*) and the lance-leaved buckthorn (*Rhamnus lanceolatus*); two species characteristic of dry sites or sandy soils: the rough rattlesnake-root (*Prenanthes aspera*) and the Hill's thistle (*Cirsium hillii*); and two herbaceous species found in swales or marshes: the glade mallow (*Napaea dioica*) and the Turk's cap lily (*Lilium superbum*).

The Indiana Department of Natural Resources, Division of Fish and Wildlife, has particular concerns about the eastern greater sandhill crane, a state-endangered species that gathers (stages) at the Jasper-Pulaski State Fish and Wildlife Refuge, approximately 50 miles north of the SSA. This refuge is the only known major staging area (Sporre, 1990) on the crane's yearly journey from southern Canada to Florida (IDNR, undated). Tens of thousands of tourists visit the refuge in the fall and spring (Sporre, 1990). Each year, over 15,000 cranes stop over at the refuge in March and November. During their stay, they feed heavily, chiefly on insects and corn stubble in upland areas, and frogs and insects in wetland areas. As a result, the cranes feed only sparingly during their migration (Bergens, 1990).

These migratory cranes fly over or very close to the SSA on their way to and from wintering areas in Florida and Georgia (Sporre, 1990), but once aloft, cranes fly at high altitudes (1,000 to 2,000 feet) (Kessel, 1984) and do not return to the ground until evening. Cranes departing from the refuge stop well south of the SSA, and the SSA lies outside the sandhill's daily foraging range, which is 2 to 15 miles from the Jasper-Pulaski State Fish and Wildlife Refuge (Ward, 1990). No crane-tower collisions with existing towers in the SSA have been reported (Bergens, 1990).

All recorded observations of state-listed plant or animal species lie more than 2 miles from any of the CGSs (Huffman, 1990).

3.1.3 Socio-Cultural Setting

The cultural history of Indiana is divided into four major periods: the Paleo-Indian, Archaic, Woodland, and Historic. Little is known of the earliest inhabitants of Indiana. However, artifacts dating to the late Archaic (*ca.* 3000 to 1000 B.C.) and middle and late Woodland (*ca.* 100 B.C. to *ca.* A.D. 1600) time periods (Mohow, 1990) are well represented, especially the late Woodland culture of the Mound Builders. This culture left behind large stockaded villages, stone-walled tombs, geometrical earthworks, and ample evidence of a settled village life (WPA, 1941).

The territory that included Indiana was claimed by the French in June 1671 and by the British 3 months later, opening a struggle between those two countries that was to continue for over a century (WPA, 1941). The first known European visitor to Indiana was the French explorer, Rene-Robert Cavelier, Sieur de La Salle, in 1679 (Winckler, 1989). He found the Potawatomi and Miami Indians settled along the banks of the Tippecanoe River. Prosperous villages with crops of corn, pumpkins, squash, and potatoes were located in the forested floodplains. These Native Americans hunted the prairies and forests of the uplands for deer, opossum, and other wild game (WCHS, 1990).

The first permanent European settlements in Indiana were military: a string of forts built by the French to protect their fur-trading interests. Among them was Fort Ouiatenon, built in 1720, 4 miles south of Lafayette. When the British took over the area in 1763, they continued the French policy of trade rather than settlement in the northwest. This policy put the northwest Indians in alliance with the British and squarely against American pioneers who were attempting to settle the area. Many Indiana tribes sided with the British in the Revolutionary War. When the British lost the war in 1783, several tribes moved to Canada. Indiana became part of the Northwest Territory in 1787 (WPA, 1941). The Indiana Territory was created by an Act of

Congress in 1800 (WCHS, 1990). During the War of 1812, the Indiana tribes once again sided with the British. When the British lost that war in 1815, American settlers began to pour into Indiana (WPA, 1941).

Indiana achieved statehood in 1816 (WPA, 1941), but European settlement in present-day White County did not commence until 1829. White County was carved from Carroll County in 1834. The Potawatomi Indians that remained in the area were driven from their riverside villages in 1837-38, as part of the forced resettlement of Native Americans to the west. The Euro-American settlement of the area was slow, as the swampy character of the land hindered land surveys and agriculture. Extensive settlement began after the completion of the Louisville, New Albany and Chicago Railway in 1853-54. The towns of Brookston and Chalmers were platted as a consequence of this railway construction. The railroad was of great benefit to the farmers of White County, as it connected them with world markets for their high quality grain and stock (WCHS, 1990).

Few significant cultural resources have been recorded in the area. Although historic site inventories exist for Carroll and Tippecanoe counties, White County has not been systematically surveyed (Carr, 1990). Nineteen archaeological sites have been recorded in White County, but none is within 1 mile of any CGS (Appendix C, Ralston, 1990, pages C-8 and C-9 of this EA). The poorly-drained soils of the SSA that are found on the CGSs, such as the Chalmers silty clay loam and Pella silty clay loam, are not expected to yield significant archaeological resources because these areas were wetlands prior to the present agricultural era (Mohow, 1990).

The Indiana State Historic Preservation Officer (SHPO) was consulted, as required by the National Historic Preservation Act (16 USC 470, *et seq.*). The Indiana SHPO recommended that an archaeological resources survey be conducted at the Sanbloom (CGS-26), Ward (CGS-33), and Lehe (CGS-36) sites to determine that no potentially significant archaeological resources would be affected by the project. The Indiana SHPO did not require that an archaeological survey be conducted at the Leader (CGS-11) or Ratcliff (CGS-12) site. This determination was based on

knowledge of aboriginal settlement patterns and the presence of very poorly drained soils on these sites (Appendix C, Ralston, 1990, pages C-8 and C-9 of this EA).

A Phase I archaeological survey was conducted in November 1990 at the Sanbloom (CGS-26), Ward (CGS-33), and Lehe (CGS-36) sites. Each site was surveyed by a professional archaeologist qualified in the State of Indiana using pedestrian transects at 8-meter (26-foot) intervals. No archaeological resources were found at the Sanbloom (CGS-26) or Ward (CGS-33) site. Two lithic artifacts were found at the Lehe (CGS-36) site, but the artifacts are not considered potentially eligible for listing on the National Register of Historic Places (NRHP) (Doershuk *et al.*, 1991).

For reasons discussed in Section 4.8.1.3, beginning on page 4.8-2 of the FEIS and Section 4.1.3 of this EA, historic properties that occur within 1.5 miles of a CGS are potentially subject to adverse visual impacts from the relay node facility. No known historic properties listed or eligible for listing on the NRHP occur within 1.5 miles of any of the sites (NRHP, 1989). However, in further consultation with the Indiana SHPO, the Indiana SHPO requested that an historic structures inventory be conducted at all five sites to identify those structures that are within 1.5 miles of a CGS and are potentially eligible for listing on the NRHP (Becker-Gilliam, 1990).

In November 1990, a Phase I historic structures inventory, consisting of a literature search and a reconnaissance survey, was conducted for all five CGSs. The literature search confirmed that no listed or eligible structures or other historic resources occur within 1.5 miles of the five CGSs. A reconnaissance survey of the structures within those areas was then conducted. The survey identified two potentially eligible properties within 1.5 miles of a CGS: Moots Creek Bridge and West Point School No. 9 (Doershuk *et al.*, 1991). Although the survey identified the Moots Creek Bridge as potentially eligible for the NRHP, further consultation with the Indiana SHPO determined that the bridge was not eligible because it was moved to its present location approximately 20 years ago (Appendix C, Ralston, 1991, pages C-10 and C-11 of this EA). Setting is important to the eligibility of the schoolhouse. Several additional properties within 1.5 miles of the CGSs have local cultural significance but

are not eligible for NRHP listing (Doershuk *et al.*, 1991). Details of the West Point School are discussed in Section 3.4 of this EA.

In compliance with the American Indian Religious Freedom Act of 1978 (42 USC 1996), the Bureau of Indian Affairs (BIA) was consulted in order to locate tribes associated with the project area. The BIA indicated that no federally recognized tribes currently live in Indiana. Federally recognized tribes historically in the area were the Shawnee, Miami, and Potawatomi tribes, who left the area over 150 years ago (Sutherland, 1992). Based on BIA recommendations, the following tribal organizations were notified of the GWEN project and information was requested regarding traditional, religious, or sacred sites within the SSA: the Stockbridge-Munsee Community, the Miami Business Committee, the Miami Tribe of Oklahoma, the Delaware Executive Committee, the Absentee-Shawnee Executive Committee, the Eastern Shawnee Tribe of Oklahoma, and the Potawatomi Business Council. The Stockbridge-Munsee Band of the Mohican Tribe responded that the area where they camped was not within the SSA: (Appendix C, Miller, 1990, page C-12 of this EA). A representative of the Eastern Shawnee Tribe of Oklahoma stated that they have no concerns with the GWEN project in northwestern Indiana (Howser, 1992). A representative of the Miami Tribe of Oklahoma stated that the tribe wishes to be notified if any human remains are found; they have no other concerns (Leonard, 1993). No responses to letters or several attempts at phone communication have been received from the other tribes. The BIA archaeologist indicated that none of the CGSs is likely to contain any traditional, religious, or sacred Native American sites because all of the sites are on flat, agricultural lands that were formerly wetlands. Sacred sites tend to contain unique topography, vegetation, or other natural features, which are not present on any of the CGSs (Sutherland, 1990).

Land use in the area is predominantly agricultural today. The primary crops are corn and soybeans, accounting for 70 percent of the land use in White County. Pasture lands represent 10 percent, while small grains, primarily wheat, represent 4 percent of the county's lands. Crop-rotation farming and row farming appear to be the most common agricultural practices. Some farms also engage in livestock production, but it

is not significant within the local economy (SCS, 1978). All CGSs are zoned A-1, Agricultural.

The transportation network is predominantly a grid of paved and gravel roads that divide the area into 1-mile-square sections. The main north-south roads within the SSA are U.S. Highway 231 and State Highway 43, which are both two-lane paved roads. The main east-west road is State Highway 18, also a two-lane paved road. None of these roadways is a designated scenic highway, and none serves as primary or secondary access to national parks or recreational areas. White County is served by the Purdue University Airport, 4 miles south of the SSA. Freight rail service is provided by the Chicago, Indianapolis and Louisville Railroad, which runs north-south through the center of the SSA.

Sources of ambient noise are limited primarily to the operation of farm equipment and to traffic. As described in Section 3.5.3, page 3.5-1 of the FEIS, local ordinances typically set maximum noise level limits at 70 to 75 dBA for land under agricultural use; however, White County does not have a local noise ordinance (Cronch, 1990b).

In 1988, the population of White County was 24,200 (Census Bureau, 1988). The 1990 census is expected to reflect zero growth; population in the county increased 1.4 percent from 1980 to 1988, or approximately 0.18 percent annually. The largest communities of the county within the SSA are the towns of Brookston (population 1,232) and Chalmers (population 544). Also included in the SSA are the towns of Battle Ground (population 818) in Tippecanoe County, and Pittsburg (population 300) in Carroll County (Rand McNally, 1990).

White County has a number of industries that provide employment for its residents, including (ranked from most jobs to least) manufacturing, retail and wholesale trade, services, transportation and other public utilities, finance and insurance, construction, and agriculture (Census Bureau, 1986). Agriculture accounts for only 1.8 percent of the county's jobs, although over 84 percent of the land is used for agriculture. Per capita income was $8,730 in 1986, below the state figure of $9,978 and the national figure of $10,797. In 1988, 8.2 percent of the labor force was unemployed, which is

higher than the state figure of 6.7 percent and the national figure of 7.0 percent (Census Bureau, 1988).

Recreational activities within the SSA are primarily based on water sports, including fishing, rafting, swimming, and boating. The Tippecanoe and Wabash rivers and Freeman Lake offer recreational resources within the SSA. All CGSs are located at least 3.2 miles from these recreational areas. Other than these specifically designated areas, most recreational activities occur in or near the area's small towns or farther north in the county along the Tippecanoe River and in the Jasper-Pulaski State Fish and Wildlife Refuge, 50 miles north of the SSA.

The visual setting is rural in character, typified by views of farmlands. The topography is fairly level; there are no hills, mountains, or significant forest vegetation near the CGSs to lend topographic or vegetative screening to these areas. Patterns of development tend to be simple geometrical shapes, which are evident in the county road system that divides the land into 1-mile-square sections and in the rows of corn and soybeans. Except for views that include towns, the complexity of the skyline is generally low as defined in Section 4.8.1.3, page 4.8-10 of the FEIS, although tall structures such as silos, grain elevators, and water towers provide variation on a local level. Trees up to 60 feet in height are commonly found along rivers, streams, and drainage ditches. Several 175-foot radio towers are found in the western portion of the SSA. Tall 170-foot towers supporting power lines cross the western portion of the SSA from northeast to southwest.

3.2 Alternative 1: Leader Site (CGS-11)

The Leader site is located on flat, level land, with a slight slope of 0.5 percent.

Soils on the site include Chalmers silty clay loam, Pella silty clay loam, and Toronto silt loam. All of these soils are classified as prime farmland when drained (SCS, 1978). All soils on the site are deep, poorly drained soils with low to moderate shrink-swell potential and no erosion hazard. The soils range from neutral to strongly acidic (pH

7.3 to 5.1). The seasonally high water table is +0.5 to 3.0 feet in depth (SCS, 1978). The Chalmers and Pella soils are hydric (SCS, 1987).

This site is drained by underlying privately owned drainage tiles which were installed prior to the Clean Water Act of 1977 (Wagner, 1990), so the site is not a designated wetland (SCS, 1991; USFWS, 1987). The U.S. Army Corps of Engineers concurs with this determination (Shelton, 1991a; Shelton, 1991b). Water draining to the west eventually reaches a branch of Big Pine Creek, the closest surface water, 375 feet to the north, via a drainage ditch located along the site's western edge, which handles intermittent rainwater runoff. The site contained no standing water at the time of the field visits.

The site is currently used for agricultural production. The site contains no trees. The surrounding land is used for agriculture and is wooded near Big Pine Creek.

There are no known archaeological resources on this site and the Indiana SHPO did not recommend an archaeological survey for this site (Appendix C, Ralston, 1990, pages C-8 and C-9 of this EA). The historic structures survey revealed no properties potentially eligible for the NRHP within 1.5 miles of this site (Doershuk *et al.*, 1991).

A residence is located across County Road 850W, less than 100 feet southwest of the site. The nearest residential community is Brookston, located 8.8 miles to the east.

3.3 Alternative 2: Ratcliff Site (CGS-12)

The Ratcliff site is on flat, level land, with a slight slope of 0.5 percent.

The only soil type present on this site is Chalmers silty clay loam. This soil type is classified as prime farmland when drained (SCS, 1978). Chalmers silty clay loam is a deep, very poorly drained soil with moderate shrink-swell potential and no erosion hazard. This soil is neutral to moderately acidic (pH 7.3 to 6.1). The seasonally high water table is +0.5 to 1.0 feet in depth (SCS, 1978). This soil is hydric (SCS, 1987).

This site is drained by underlying privately owned drainage tiles which were installed prior to the Clean Water Act of 1977 (Wagner, 1990), so the site is not a designated wetland (SCS, 1991; USFWS, 1987). The U.S. Army Corps of Engineers concurs with this determination (Shelton, 1991a; Shelton, 1991b). Water draining from the site eventually reaches a branch of Big Pine Creek, the closest surface water, 300 feet to the south, via drainage ditches located along the site's western and eastern edges, which handle intermittent rainwater runoff. The site contained no standing water at the time of the field visits.

The site is currently used for agricultural production. The site is plowed and contains no trees. The surrounding land is used for agriculture and is wooded near Big Pine Creek.

There are no known archaeological resources on this site and the Indiana SHPO did not recommend an archaeological survey for this site (Appendix C, Ralston, 1990, pages C-8 and C-9 of this EA). The historic structures survey revealed no properties potentially eligible for the NRHP within 1.5 miles of this site (Doershuk *et al.,* 1991).

The nearest residential community is Brookston, located 8.9 miles to the east.

3.4 Alternative 3: Sanbloom Site (CGS-26)

The Sanbloom site lies on flat, level land, with a slope of less than 1 percent.

Soils on the site consist of Wolcott clay loam, Darroch silt loam, and Rensselaer clay loam. These soils are considered prime farmland when drained. All soils on the site are deep, poorly drained soils with low to moderate shrink-swell potential and slight erosion hazard. The soils range from neutral to very strongly acidic (pH 7.3 to 4.5). The seasonally high water table is +0.5 to 3.0 feet in depth (SCS, 1978). The Wolcott and Rensselaer soils are hydric (SCS, 1987).

This site is drained by underlying privately owned drainage tiles which were installed prior to the Clean Water Act of 1977 (Wagner, 1990), so the site is not a designated wetland (SCS, 1991; USFWS, 1987). The U.S. Army Corps of Engineers concurs with this determination (Shelton, 1991a; Shelton, 1991b). Water draining to the northeast eventually reaches Big Creek, the closest surface water, 1,750 feet to the north, via an intermittent drainage ditch located along the site's eastern edge, which handles intermittent rainwater runoff. Big Creek serves as agricultural drainage in the vicinity of the site, and has no associated riparian vegetation. The site contained no standing water at the time of the field visits.

The site is currently used for agricultural production. The site is plowed and contains no trees. The surrounding land is used for agriculture and grazing and is wooded near Big Creek.

The on-site archaeological survey revealed no known archaeological resources on this site (Doershuk *et al.*, 1991).

The historic structures survey revealed one property potentially eligible for the NRHP within 1.5 miles of the CGS, the West Point School No. 9 (see Figure 3.1 of this EA). Although the historic schoolhouse is 1.5 miles south of the CGS if measured from the border of the CGS, it is approximately 1.6 miles from the proposed tower. The schoolhouse, a one-room, frame structure dating from the late 19th century, illustrates balloon framing construction and the role of dimensional lumber in the development of rural Indiana. The schoolhouse may be the only survivor of what once was a common feature of the rural landscape of northern Indiana. Due to a lack of urban infrastructure, such as freeways and towers, in the area of the CGS, the rural landscape has been preserved, providing an appropriate setting for the historic structure. Setting, location, and materials are integral to the structure's significance and to its potential eligibility for the NRHP (Doershuk *et al.*, 1991).

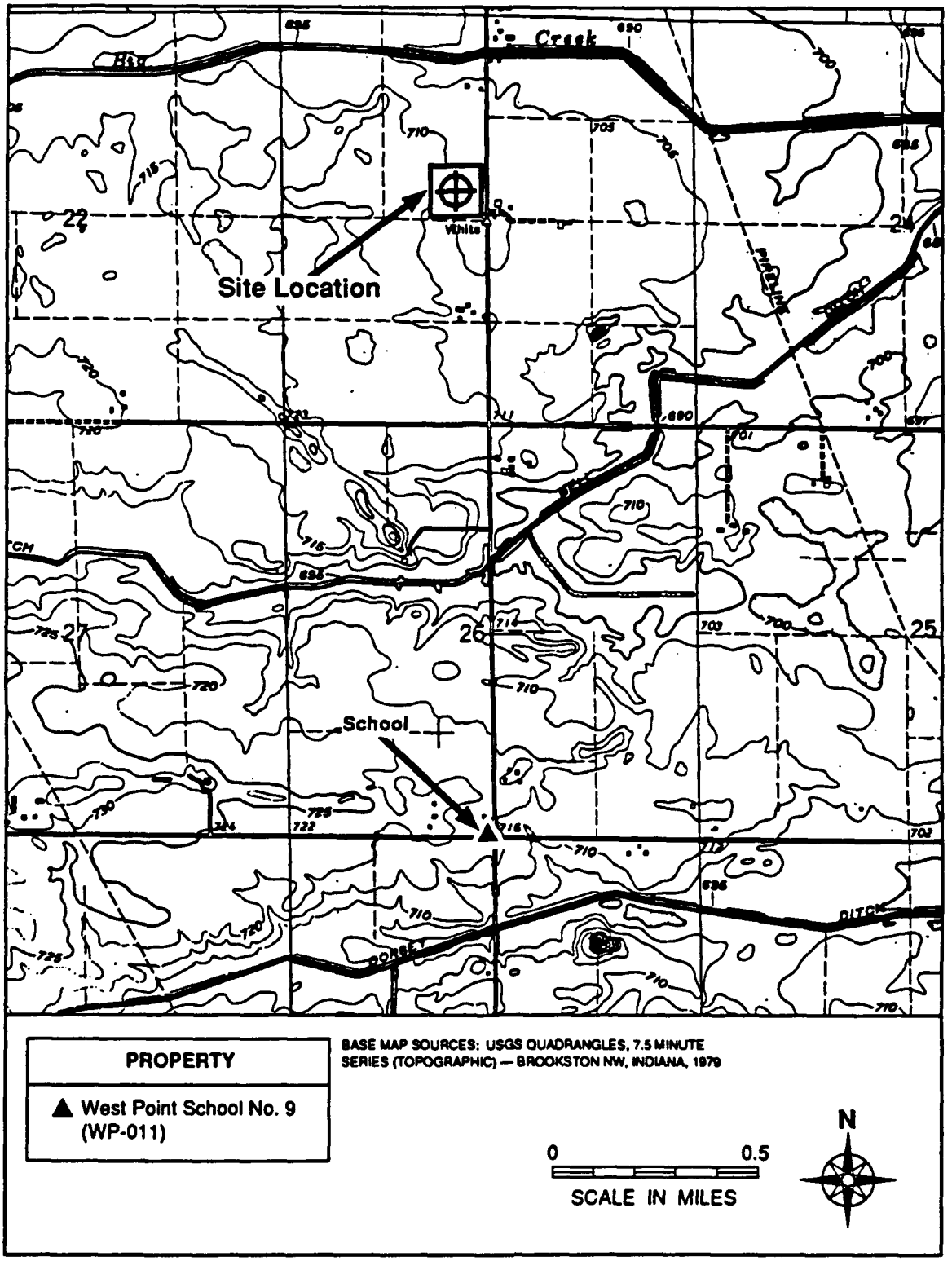

FIGURE 3.1 LOCATION OF PROPERTY THAT IS POTENTIALLY ELIGIBLE FOR LISTING ON THE NATIONAL REGISTER OF HISTORIC PLACES WITHIN 1.5 MILES OF THE SANBLOOM SITE (CGS-26)

The CGS is located in an undeveloped rural area where the community structure is strongly intact. The historical integrity of the area is enhanced by the existence of the schoolhouse, a cemetery, and several old farm complexes. The surrounding area is open and flat, divided by narrow dirt roads following section lines, and punctuated occasionally by a grove of trees or a lone farm building (Doershuk et al., 1991). A line of power poles is situated on the east side of County Road 450W. The nearest residential community is Chalmers, located 4.5 miles to the southeast.

3.5 Alternative 4: Ward Site (CGS-33)

The Ward site lies on flat, level land, and has no gradients greater than 1 percent. Soils on the site include Wolcott clay loam, Conover loam, Montmorenci loam, Rensselaer clay loam, and Martinsville silt loam. With the exception of the Montmorenci and Martinsville soils, all the soils on the site drain poorly; the erosion hazard ranges from slight to none. All these soil types are classified as prime farmland when drained, except the Martinsville soil which is located in the site's northeastern corner and is classified as prime farmland even if undrained. The soils range from neutral to strongly acidic (pH 7.3 to 5.1). The seasonally high water table is +0.5 to 3.0 feet in depth, except on Martinsville and Montmorenci soils, where the water table is over 3 feet in depth (SCS, 1978). The Wolcott and Rensselaer soils are hydric (SCS, 1987).

The site is drained by underlying privately and county-owned drainage tiles which were installed prior to the Clean Water Act of 1977, including a 12-inch field drain running east-west across the center of the site. However, one area in the northwest corner of the site is still designated on National Wetlands Inventory maps as a palustrine emergent temporarily flooded wetland (USFWS, 1987) (see Figure 3.2 of this EA). A survey conducted by the SCS also concluded that the area is a farmed wetland (SCS, 1991). The U.S. Army Corps of Engineers concurs with this determination (Shelton, 1991a; Shelton, 1991b). This seasonal wetland on the site covers approximately 1.07 acres, part of a larger 5.5 acre farmed wetland. Standing water on the portion of the wetland on the site was approximately 12 inches deep in March 1990 and supported no hydrophytic vegetation at the time of the field visits in

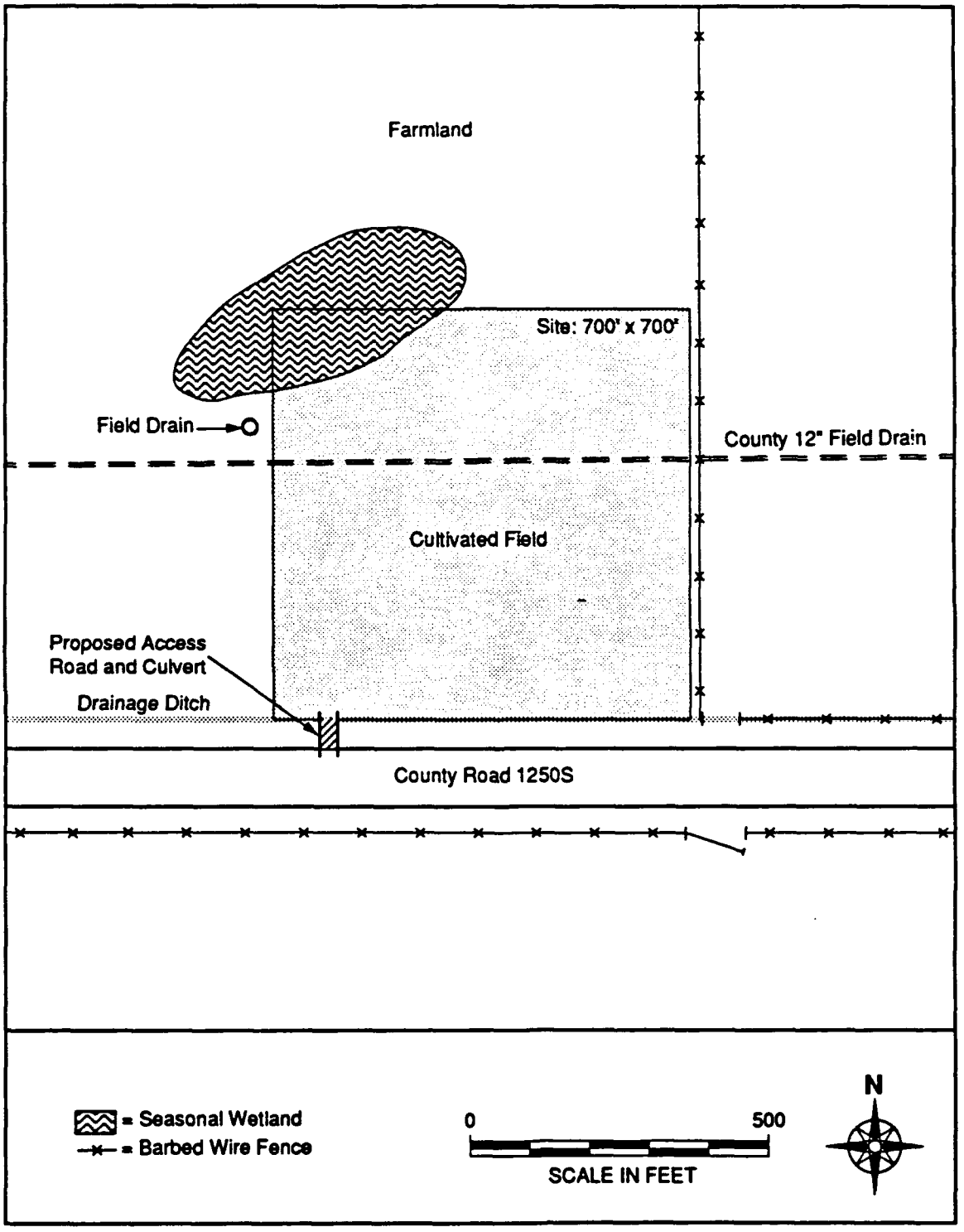

FIGURE 3.2 APPROXIMATE LOCATION OF SEASONAL WETLAND ON THE WARD SITE (CGS-33)

March and October 1990. The depression in this area of the site collects runoff from portions of the site and adjacent areas during the rainy season. Ponding may be caused by soil compaction or defective drainage tiles in addition to the presence of poorly drained hydric soils (Wagner, 1990). During the drier months the area and surrounding lands are cultivated with corn. The area was difficult to locate in October when it was distinguished only by slightly moister soil and thinner corn (Moore, 1990). No wildlife or livestock use this seasonal wetland for drinking or watering habitat. It is important primarily for flood control and groundwater recharge (Poole, 1990).

Runoff that is not trapped in on-site depressions drains through tile to a drainage ditch along the site's southern border. That ditch eventually discharges into Moots Creek, the closest perennial stream, 0.75 mile to the east.

The site is currently used for agricultural production. The site is plowed and contains no trees. The surrounding land is used for agriculture and is wooded near Moots Creek.

The on-site archaeological survey revealed no known archaeological resources on this site (Doershuck *et al.*, 1991).

The historic structures survey revealed no properties potentially eligible for the NRHP within 1.5 miles of the site (Doershuck *et al.*, 1991).

The nearest residential community is Brookston, 1.8 miles to the northwest.

3.6 Alternative 5: Lehe Site (CGS-36)

The Lehe site lies on flat, level land, with a slope of less than 1 percent.

Soils on the site consist of Darroch silt loam and Rensselaer clay loam. These soils are classified as prime farmland when drained. The soils on the site are deep, poorly drained soils with low to moderate shrink-swell potential and slight erosion hazard. The soils range from neutral to very strongly acidic (pH 7.3 to 4.5). The seasonally

high water table is +0.5 to 3.0 feet in depth (SCS, 1978). Rensselaer soils are hydric (SCS, 1987).

This site is drained by underlying privately owned drainage tiles which were installed prior to the Clean Water Act of 1977 (Wagner, 1990). Even though a small area in the southeastern portion of the site is subject to ponding during the rainy season, the site is not a designated wetland as determined by a field survey by the SCS (SCS, 1991) and confirmed by the U.S. Army Corps of Engineers (Shelton, 1991a; Shelton, 1991b). It is also not designated as a wetland on National Wetlands Inventory maps (USFWS, 1987). The site was dry when observed during field surveys in October 1990 (Moore, 1990) and January 1991 (SCS, 1991). In March 1990, an area adjacent to the eastern boundary was approximately 6 inches deep in water. This ponding may be caused by soil compaction or defective drainage tiles in addition to the presence of poorly drained hydric soils (Wagner, 1990). During drier months the area dries up via tile drainage or evaporation and is cultivated with corn along with the surrounding lands. No wildlife or livestock use this ponded area for drinking or watering habitat (Poole, 1990).

Water on the site drains to the south. Drainage from tiles enters a man-made ditch, which runs along the site's southern boundary and handles intermittent rainwater runoff. This ditch eventually empties into Moots Creek, the closest perennial stream, 1.3 miles from the site.

The site is currently used for agricultural production. The site is plowed and contains no trees. The surrounding land is used for agriculture and is wooded near Moots Creek.

The on-site archaeological survey revealed a prehistoric site (12WH35) on the CGS. However, the site is not considered potentially eligible for listing on the NRHP (Doershuck *et al.*, 1991).

The historic structures survey revealed no properties potentially eligible for the NRHP within 1.5 miles of the site (Doershuck *et al.*, 1991).

The CGS is adjacent to the Chicago, Indianapolis and Louisville Railroad right-of-way, which runs diagonally 50 to 250 feet east of the eastern site boundary. Brookston, the nearest residential community, is 1.3 miles north. The nearest residential area within the city limits of Brookston is 1.5 miles north of the CGS. Aside from the low-lying, forested floodplain of Moots Creek, the terrain between Brookston and the CGS is flat and agricultural. Sixty-foot trees line the southern boundary of Brookston, along Moots Creek.

4.0 ENVIRONMENTAL CONSEQUENCES OF ACTION ALTERNATIVES

This section discusses the potential impacts of the GWEN project on the environmental setting of the five CGSs in northwestern Indiana. Several impacts that would be common to some or all of the action alternatives are discussed in Section 4.1 of this EA. Impacts that are unique to each action alternative are discussed in Sections 4.2 through 4.6 of this EA. The project would have no significant impacts at any of the sites, as indicated in Sections 4.2 through 4.6 of this EA.

4.1 Common Features

Presented below is information on the physical, biological, and socio-cultural impacts common to some or all of the action alternatives.

4.1.1 Physical

Impacts from **construction** activities would not be significant. Construction would require localized earth-moving, including excavation and backfilling for placement of foundations and guy-wire anchors. Less than 3,800 square feet would be covered with concrete and gravel for the tower base and the equipment area enclosures. Similar coverage would be required for on-site access roads and parking; incidental activities during construction would disturb a similar amount. In total, about 0.25 acre would be occupied by foundations and the on-site access roads. Construction of the access road and installation of utility lines would have no significant impacts because they would cover less than 360 square feet of land along the previously graded public highway right-of-way.

The ground plane would be installed using machines that bury wire approximately 1 foot below the surface with minimal disturbance of the soil surface. This process would require moving a small tractor or similar equipment over much of the 11-acre site, but it would not significantly disturb the existing vegetation or create a significant erosion hazard.

It is not possible to obtain accurate maps of the locations of all drainage tiles at the sites. Avoiding construction over or within close proximity of these tiles is of utmost importance, but it may not be practical. If drainage tiles are damaged or must be removed for construction, the Air Force will relocate or repair them in such a fashion to avoid flooding. In such cases where relocation or repair is deemed necessary, the Air Force will install perforated clay pipe in place of the existing clay tile to a point off the land owned or being leased by the Air Force. The clay pipe will be connected to the continuing clay tile in such a fashion as not to permanently disrupt the flow. The newly installed clay pipe will also be wrapped with screening material to prevent the washing away of any fine soils.

Impacts to **mineral resources** would be minor, as indicated in Section 4.1.1.4, page 4.1-2 of the FEIS. In most cases, mineral resources were avoided in the siting process. There are no known mineral or energy resources in the SSA, although the SSA contains a few abandoned quarries, which are presently filled with water (Cronch, 1990a). If any mineral resources were found under a site, access to them is unlikely to be restricted, due to the small size of the GWEN site. If access is restricted, development of the site would only deny access to a small portion of those resources for the lifetime of the project and would not result in any significant impact.

Significant impacts on **paleontological resources** are not anticipated because fossils are unlikely to occur on any CGS (Rexroad, 1990). However, if any fossils are found during construction, work that might affect them will be suspended while the Division of Historic Preservation and Archaeology of the Indiana Department of Natural Resources is notified and the significance of the find is evaluated.

Erosion and increase in storm water runoff would not be significant. All sites have slopes of 1 percent or less, so any required grading to level the site would be minimal. In addition, standard measures for erosion control would be used during and after site construction, including replanting the site.

No CGS lies within a **100-year floodplain** (FIA, 1978; FIA, 1981a; FIA, 1981b).

A maximum of 11 acres of **prime farmland** would be removed from production for the duration of the project. However, impacts of GWEN development on agricultural land would not be significant, as discussed in Section 4.1.1.3, page 4.1-2 of the FEIS.

No significant impacts on **drinking water** are expected, as discussed in Sections 3.2.4.1 and 4.2.1.1, pages 3.2-2 and 4.2-3 of the FEIS. Corrosion of the ground plane is not anticipated to raise copper concentrations in any aquifer or surface water body by more than 20 micrograms per liter (µg/l). This would represent 2 percent of the maximum allowable copper concentrations permitted by the Environmental Protection Agency (EPA) for raw water sources for potable water supply (EPA, 1985). The EPA standard is intended to maintain the aesthetic properties that relate to public acceptance of drinking water and is not related to public health. A threshold for the effects of copper on human health has not been determined (EPA, 1985). The State of Indiana does not have drinking water standards that are separate from the federal regulations (McDaniel, 1990b).

Impacts on **surface water or wetlands** that support aquatic plants and animals would not be significant. Potential impacts could occur when the ground plane is less than 300 feet from surface water or wetlands, if the soil is acidic, or the depth to the seasonally high water table is less than 3 feet from the ground plane (4 feet from the surface), as discussed in Section 4.2.1.1, page 4.2-3 of the FEIS. Impacts are not expected at the Leader (CGS-11), Ratcliff (CGS-12), or Sanbloom (CGS-26) sites because these sites are at least 300 feet from surface water and wetlands. At that distance, the increase in copper concentrations would be insignificant, as discussed in Section 4.2.1.1, page 4.2-3 of the FEIS. Although the Ward site (CGS-33) contains a seasonal wetland and the Lehe site (CGS-36) contains other seasonal surface water, no significant impacts to surface water or wetlands are expected, as discussed in Sections 4.5 and 4.6 of this EA.

Impacts on **air quality** would not be significant. Temporary but insignificant increases in air pollutant emissions would occur during construction, primarily from

greater use of heavy machinery than would be required in normal farming operations. During operation of the BUPG at 100 percent load, total yearly emissions from the BUPG would be less than 350 pounds per pollutant, as described in Section 2.1.2 of this EA. These are well below the standards set by the Clean Air Act (42 USC 7401, *et seq.*), which requires permits for facilities emitting any single regulated substance at the rate of 50 tons per year. Hence, the project would not result in violation of National Primary and Secondary Ambient Air Quality Standards, which have been adopted by the State of Indiana (326 IAC 1-3-4). Moreover, as stated in Section 4.3.1.2 of the FEIS, beginning on page 4.3-1, maximum hourly emissions are 2.2 pounds (1 kg) per hour or less and would not require permits under the State of Indiana regulations based on hourly emission rates (326 IAC 2-1-1, Section 1 (b) (4)).

4.1.2 Biological

Impacts on **wildlife and wildlife habitats** would not be significant. Each CGS is a cultivated field, and each is far from extensive areas of woodland, ponds, lakes, or perennial streams. With the exception of the Ward site (CGS-33), no site is within 300 feet of wetlands (SCS, 1991; Shelton, 1991a; Shelton, 1991b; USFWS, 1987). The seasonal wetland at the Ward site is cultivated and contains no sensitive aquatic species or hydrophytic vegetation (Moore, 1990). Consequently, no critical or exceptionally valuable wildlife habitats would be at risk or would be close enough to attract waterfowl or other wildlife to the tower's vicinity. The USFWS concurs that there is no critical habitat for federally endangered species in the project area (Appendix C, Hudak, 1990, pages C-4 and C-5 of this EA).

No federally listed **threatened or endangered species** is likely to be affected. This determination was made after informal consultation with the USFWS in compliance with Section 7 of the Endangered Species Act of 1973, as amended (16 USC 1531, *et seq.,* at 1536) (Appendix C, Hudak, 1990, 1992, pages C-6 to C-7, C-13, and C-14 of this EA). Furthermore, consultation with the State of Indiana Department of Natural Resources determined that no state-listed rare, threatened, or endangered species or unique biological communities would be significantly affected (Bergens, 1990; Ward, 1990). Although the Indiana Department of Natural Resources

has particular concerns about the eastern greater sandhill crane, this species would not be significantly affected. Impacts to the crane's habitat are not expected because the SSA does not lie within the sandhill's daily foraging range (Ward, 1990). In addition, the cranes do not normally forage in the SSA during their migration (Bergens, 1990) and, when flying, fly at high altitudes, well above 300 feet (Kessel, 1984). Cranes leaving the Jasper-Pulaski State Fish and Wildlife Refuge do not return to the ground until evening and stop well south of the SSA. Although the SSA has numerous large towers, no bird-tower collisions involving sandhill cranes have been reported within the SSA (Bergens, 1990).

Other **bird collisions** with the tower may occur but are not expected to be significant. Section 4.4.1.5, page 4.4-5 of the FEIS states that the majority of bird collisions occur in adverse weather conditions when the visibility of man-made structures is obscured and birds may be forced to lower their flight level. Generally, songbirds (passerines) are more likely to collide with a tower or the guy wires than are raptors or waterfowl (Avery *et al.*, 1980). Areas with high concentrations of bird flight activity, feeding and nesting habitats, known migration corridors, raptor roosting areas, and prominent topographical features such as high ridges and waterways that could concentrate avian flight lanes were avoided. Each of the sites is at least 3.2 miles from the Tippecanoe and Wabash rivers and therefore outside the primary foraging zone that surrounds the river corridors. Birds enter and leave the river corridors from all directions and show no preferred migratory path (Ward, 1990).

4.1.3 Socio-Cultural

Local employment would be increased slightly, primarily through use of local subcontractors for earth-moving and possibly for some of the facility's maintenance.

Impacts on **community support systems** would not be significant because the relay node will be unmanned and will use modest amounts of power (comparable to that used by an average single-family house). Security needs will be met through agreements with local police officials to monitor the integrity of the site during routine patrols, as detailed in Section 4.6.1.1, page 4.6-1 of the FEIS.

Impacts on **land use** would not be significant. All CGSs are zoned A-1, Agricultural. Care was taken in the site selection process to maintain setbacks from institutional uses such as schools, churches, recreational areas, and areas zoned residential. The tower would not significantly affect property values because non-noxious, nonresidential land uses, such as the proposed relay node, have no systematic effect on housing values, as stated in Section 4.7.1.3, page 4.7-8 of the FEIS.

Construction **noise** impacts would be temporary and insignificant. Operational noise from the back-up generator would be less than 72 dBA at the site boundary. At 50 feet beyond the site boundary the noise level would drop below 65 dBA, as discussed in Section 2.1.3 of this EA. Although White County has no noise ordinances, this noise level is within the standards typically set for residential and mixed residential/ agricultural use (55 to 65 dBA), as stated in Section 3.5.3, page 3.5-2 of the FEIS. In addition, the BUPG would only operate at this noise level for 2 hours per week during testing and during commercial power outages. The Ratcliff (CGS-12), Sanbloom (CGS-26), Ward (CGS-33), and Lehe (CGS-36) sites are remote from any residences, so noise impacts at these sites would not be significant. Potential impacts to a residence located next to the Leader site (CGS-11) are discussed in Section 4.2 of this EA.

Impacts on **public health and safety** would not be significant, as discussed in Sections 4.11 and 4.12, beginning on pages 4.11-1 and 4.12-1, respectively, of the FEIS. Shock and burn risks would be associated with the buildup of electrical charges on ungrounded metallic objects inside the inner exclusionary (8-foot) fence located approximately 20 feet from the tower base. However, a grounded person within the outer exclusionary (4-foot) fence located approximately 330 feet from the tower base who touches an ungrounded object while the tower was transmitting would experience only a mild shock, sufficient to cause the individual to break contact but not cause harm. Furthermore, because the transmission periods would total between 6 and 8 seconds per hour during normal operations, the risk of even these mild shocks would be insignificant. Only a determined effort to enter the inner exclusionary zones, within the 8-foot fence, would put a person at increased risk of higher shock and a higher

specific absorption rate, dependent on the period of prolonged grasping contact with an ungrounded metallic object. Fire hazards at the relay node facility would be low, as discussed in Section 4.12.1.1, page 4.12-1 of the FEIS. Radio-frequency emissions would not cause adverse health effects, as discussed in Section 4.4.1.6, pages 4.4-6 and 4.4-7 of the FEIS. Subsequent to the publication of the FEIS, further study confirmed the conclusion of the FEIS that there is no evidence of adverse effects of GWEN radio-frequency emissions on public health (NRC, 1992).

The relay node would operate in the LF band and therefore would not interfere with pacemakers, emergency communications, commercial and amateur radios, televisions, or garage door openers, as noted in Section 2.1.1.1, page 2-3 of the FEIS.

Impacts on **archaeological resources** would not be significant. The archaeological survey revealed no archaeological resources that are potentially eligible for the NRHP on any of three sites surveyed (Doershuk *et al.*, 1991). The Indiana SHPO did not require an archaeological survey at the Leader (CGS-11) or Ratcliff (CGS-12) site, based on knowledge of aboriginal settlement patterns and the presence of very poorly drained soils on these sites (Appendix C, Ralston, 1990, pages C-8 and C-9 of this EA). The Indiana SHPO concurs that no known archaeological resource would be affected by the GWEN project (Appendix C, Ralston, 1991, pages C-10 and C-11 of this EA). If any archaeological resources are found during construction, work that might affect them would be suspended while the Indiana SHPO is notified, in accordance with the provisions of 16 USC 470, *et seq.*, at 470f.

Impacts on **historic properties** would not be significant. The only potentially eligible site identified during the historic structures survey was the West Point School No. 9, which is located 1.5 miles south of the Sanbloom (CGS-26) site. Setting is considered important to its eligibility (Doershuk *et al.*, 1991). Impacts on the school would not be significant, as discussed in Section 4.4 of this EA. The Indiana SHPO concurs with this determination (Appendix C, Ralston, 1991, pages C-10 and C-11 of this EA).

Significant impacts on **Native American traditional, religious, or sacred sites** are not anticipated. Based on BIA recommendations (Sutherland, 1992), seven tribal

organizations with historic roots in the area were notified of the GWEN project and information was requested regarding traditional, religious, or sacred sites within the SSA: the Stockbridge-Munsee Community, the Miami Business Committee, the Miami Tribe of Oklahoma, the Delaware Executive Committee, the Absentee-Shawnee Executive Committee, the Eastern Shawnee Tribe of Oklahoma, and the Potawatomi Business Council. The Stockbridge-Munsee Band of the Mohican Tribe responded that the area where they camped was not within the SSA (Appendix C, Miller, 1990, page C-12 of this EA). A representative of the Eastern Shawnee Tribe of Oklahoma stated that they have no concerns with the GWEN project in northwestern Indiana (Howser, 1992). A representative of the Miami Tribe of Oklahoma stated that the tribe wishes to be notified if any human remains are found; they have no other concerns (Leonard, 1993). No responses to letters or several attempts at phone communication have been received from the other tribes. The BIA archaeologist indicated that none of the CGSs is likely to contain any traditional, religious, or sacred Native American sites because all of the sites are on flat, agricultural lands that were formerly wetlands. Sacred sites tend to contain unique topography, vegetation, or other natural features, which are not present on any of the CGSs (Sutherland, 1990).

Visual impacts associated with a GWEN tower are discussed in Sections 3.8 and 4.8, pages 3.8-1 and 4.8-1, respectively, of the FEIS. The significance of a visual impact would depend on the visual dominance of the GWEN facility and the sensitivity of the affected views. Visual dominance is the degree to which a GWEN facility would compete with other features of the existing landscape for the attention of the viewer. Section 3.8.4, page 3.8-3 of the FEIS defines four levels of dominance, called Visual Modification Classes (VMC):

- VMC 1, not noticeable: the tower would be overlooked by all but the most interested viewers

- VMC 2, noticeable, visually subordinate: the tower would be noticeable to most viewers without being pointed out but would not compete with other features for their attention

- VMC 3, distracting, visually codominant: the tower would compete with other features in the landscape for the viewer's attention

- VMC 4, visually dominant, demands attention: the tower would be the focus of attention and tend to dominate the view.

Visual sensitivity is a measure of the public's reaction to a proposed change of the affected view and is a function of the viewer's activity, awareness, goals, and values. Consequently, the more sensitive the view, the stronger will be the public reaction to any alteration of it. Areas defined in the FEIS as having high visual sensitivity include national and state parks; designated scenic routes; designated national, state, or local historic sites where setting is important to their historic significance; and travel routes providing access to these sites. Examples of areas having medium visual sensitivity would be locally popular, but undesignated, beaches or public use areas, and the travel routes that provide primary access to them. Travel routes that pass near or provide access to high sensitivity views, such as historic properties, but primarily serve other destinations are considered medium sensitivity. Travel routes are considered sensitive on segments within 0.5 mile of the property and 1.5 miles of the tower, based on FEIS criteria and review by visual analysis specialists (Duffey, 1991). Low visual sensitivity includes those views from sites, areas, travel routes, and sections of travel routes not identified as medium and high in sensitivity.

Significant visual impacts would occur if the relay node facility were to dominate or codominate (VMC 4 or 3) a high-sensitivity view or dominate (VMC 4) a medium-sensitivity view. If the relay node facility cannot be seen from medium-to-high sensitivity routes or areas, then visual impacts are not considered significant. Distance is the primary factor in determining visual dominance and therefore visual impacts. At distances greater than 3 miles, a GWEN tower would not be visible to the unaided eye. At 1.5 to 3 miles, the tower would be subordinate if noticeable (VMC 2) but more usually would not be noticed (VMC 1) because of its grey color and lack of mass. If a viewer at this distance actively sought the tower, it would appear as a thin vertical line on the horizon. Within 1.5 miles, the tower becomes a more important component of

the view. In addition, other aspects of the tower's setting, such as focal point sensitivity, skyline complexity, competing feature interest, and topographic and vegetative screening, become important considerations in determining the level of visual impact.

USGS topographic maps and a windshield survey were used to determine whether high or medium sensitivity views were within 1.5 miles of the CGSs. The visual impacts associated with each site are discussed in Sections 4.2 to 4.6 of this EA.

4.2 Alternative 1: Leader Site (CGS-11)

No significant impacts are expected.

To minimize **noise** impacts to the residence located west of the site across County Road 850W, the BUPG would be located at least 100 feet from the residence with its exhaust side facing away from the residence. This would ensure that noise levels were below 65 dBA, the residential standard established in Section 3.5.3, page 3.5-2 of the FEIS.

Visual impacts would not be significant because there are no medium or high sensitivity views within 1.5 miles of the site.

4.3 Alternative 2: Ratcliff Site (CGS-12)

No significant impacts are expected.

Visual impacts would not be significant because there are no medium or high sensitivity views within 1.5 miles of the site.

4.4 Alternative 3: Sanbloom Site (CGS-26)

No significant impacts are expected.

Impacts on **historic properties** would not be significant. West Point School No. 9, potentially eligible for the NRHP, is 1.5 miles south of the CGS and is considered a high sensitivity view. Setting, location, and materials are all integral to its significance. The school and the proposed tower are both located on the west side of County Road 450W, a straight north-south road. The view from the school north to the tower would be unobstructed by intervening topography or vegetation. Competing feature interest is provided by electric power poles along County Road 450W; this road also provides some focal point sensitivity. The complexity of the skyline is low except for the power poles. At a distance of 1.5 miles, the tower would begin to diminish in dominance, appearing as a thin grey vertical line. At that distance, the tower would be noticeable, but visually subordinate (VMC 2) to the power poles along County Road 450W, resulting in no significant impact. The Indiana SHPO concurs that the GWEN tower would have no significant impacts on West Point School No. 9 (Appendix C, Ralston, 1991, pages C-10 and C-11 of this EA).

Visual impacts to travel routes to this NRHP property would not be significant. County Road 450W has medium sensitivity because it provides access to the West Point School No. 9 but primarily serves other destinations. The road would come within 10 feet of the tower site and eventually reach the school 1.5 miles south. Driving south on County Road 450W from the tower site towards the school, the tower would be behind the driver and therefore not in the same field of view with the school. Driving north away from the school towards the tower, the school would also not be in the same field of view with the tower. As the tower would not be visible when approaching or driving away from the school, there would be no significant impact to County Road 450W.

There are no other high or medium sensitivity views within 1.5 miles of the site.

4.5 Alternative 4: Ward Site (CGS-33)

No significant impacts are expected.

Impacts on **surface water** would not be significant. The area subject to seasonal ponding, and designated as a seasonal wetland, in the site's northwestern corner could be impacted by copper leachate from the ground plane, due to the presence of acidic soils and a seasonally high water table of less than 3 feet below the surface. However, the water quality of the seasonal standing water is not a significant environmental concern, according to criteria provided by the Indiana Department of Environmental Affairs, Office of Water Management (Winters, 1990b). The seasonal wetland supports no sensitive aquatic species or hydrophytic vegetation, and does not serve as a drinking water source for livestock, waterfowl, or other wildlife. There is no public access to the wetland, as it is located on privately farmed property. Drainage from the site eventually reaches Moots Creek 1.5 miles east of the site. Therefore, no significant impacts are anticipated. The Indiana Department of Environmental Affairs concurs with this determination (Winters, 1991).

Impacts on **wildlife and wildlife habitats** would not be significant. The site is cropland and was planted with corn at the time of a field visit in October 1990. It contains no unique or high quality wildlife habitat, and the seasonal wetland area on the site does not serve as a drinking water source for livestock, waterfowl, or other wildlife. The site is underlain by drainage tile and contains no hydrophytic vegetation. In addition, construction of a GWEN tower would not significantly alter the seasonal wetland, since it is at the northwestern edge of the site (see Figure 3.2 of this EA) where the only disturbance would be from installation of the ground plane wires 1 foot below the surface and the 4-foot-tall perimeter fence. Although the USFWS recommends avoidance of this site due to its inclusion on the National Wetlands Inventory maps, impacts of GWEN development on this habitat would not be significant. The area impacted by construction would not extend beyond the 330-foot radius perimeter fence and would be less than one acre. If this site is selected for GWEN development, the proposed project is permitted under nationwide permit 26 (33 CFR 330.5 (26)) (Shelton, 1991b). The State of Indiana waives the requirement for a

water quality certificate for any activity which conforms to any of the nationwide permits (Shelton, 1991c). Therefore, a water quality certificate under Section 401 of the Clean Water Act (33 USC 1251, *et seq.*) is not required.

Visual impacts would not be significant because there are no medium or high sensitivity views within 1.5 miles of the site.

4.6 Alternative 5: Lehe Site (CGS-36)

No significant impacts are expected.

Impacts on **surface water** would not be significant. The area subject to seasonal ponding in the southeastern portion of the site could be impacted by copper leachate from the ground plane, due to the presence of acidic soils and a seasonally high water table less than 3 feet below the surface. However, the water quality of the seasonal standing water is not a significant environmental concern, according to criteria provided by the Indiana Department of Environmental Affairs, Office of Water Management (Winters, 1990b). The seasonal pond supports no sensitive aquatic species or hydrophytic vegetation, and does not serve as a drinking water source for livestock, waterfowl, or other wildlife. There is no public access to the pond, as it is located on privately farmed property. Drainage from the site eventually reaches Moots Creek 1.3 miles east of the site. Therefore, no significant impacts are anticipated. The Indiana Department of Environmental Affairs concurs with this determination (Winters, 1991).

Impacts to **wildlife and wildlife habitats** would not be significant. The site is cropland and was planted with corn at the time of a field visit in October 1990. It contains no unique or high quality wildlife habitat and the area of seasonal ponding on the site does not serve as a drinking water source for livestock, waterfowl, or other wildlife. This area is underlain by drainage tile and contains no hydrophytic vegetation. A field survey conducted by the SCS confirmed that the CGS and areas within 300 feet were not designated wetlands (SCS, 1991). The U.S. Army Corps of Engineers concurs with this determination (Shelton, 1991a; Shelton, 1991b).

Visual impacts would not be significant. Brookston, the nearest town, is 1.3 miles north of the CGS. Views from the closest residential area of the town, which is slightly more than 1.5 miles from the CGS, contain low skyline complexity, no focal point sensitivity, and no competing features. The lower half of the tower would be screened from view by a thick band of 60-foot trees along Moots Creek, south of Brookston. The upper half of the tower would be visible above the band of vegetation. Seen from that distance, the tower would appear as a thin grey vertical line and would therefore be noticeable, but visually subordinate (VMC 2).

4.7 No Action Alternative

No environmental impact would result from adoption of the no action alternative.

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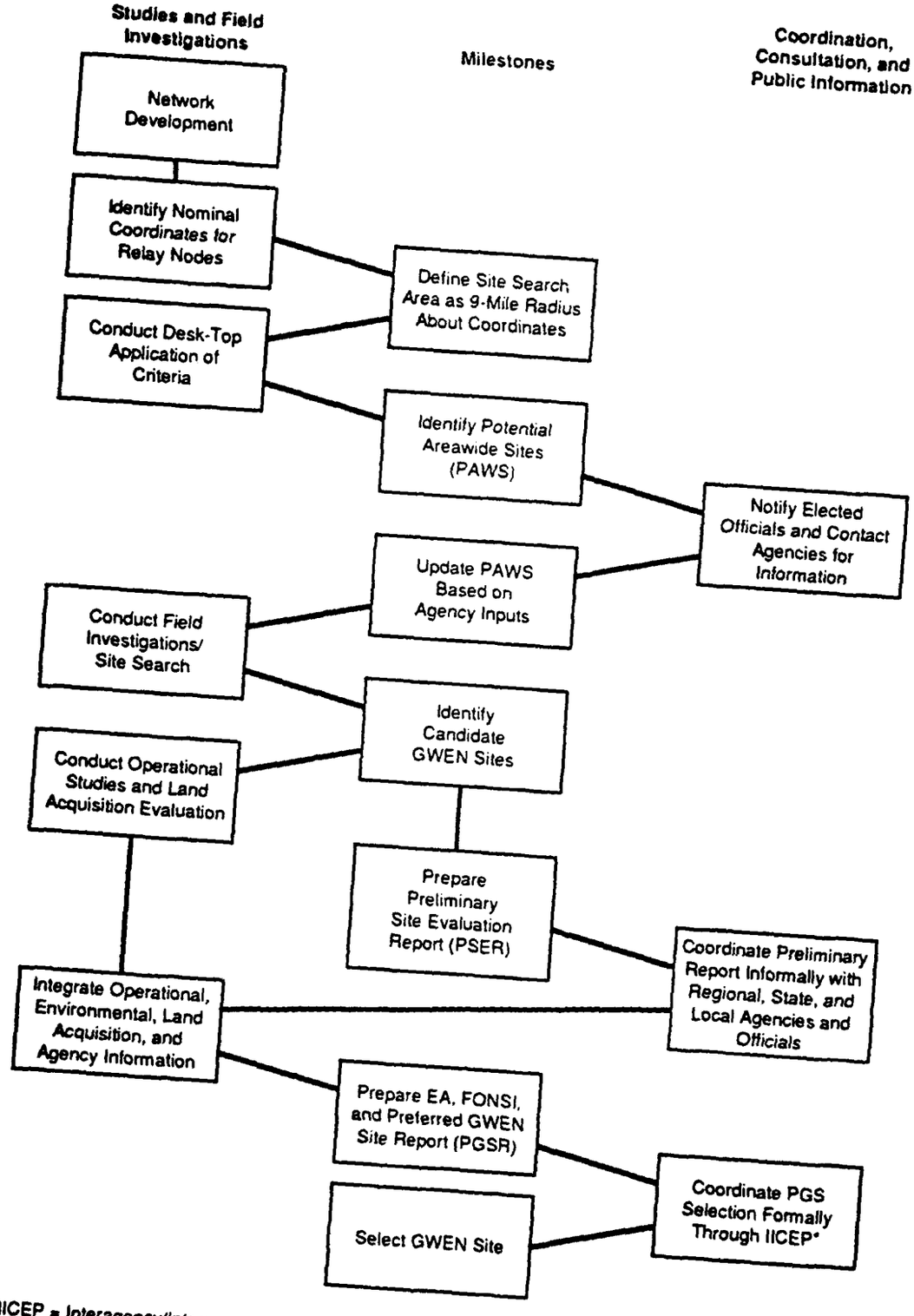
APPENDIX A

SITE SELECTION PROCESS

SITE SELECTION PROCESS

Figure A.1 of this EA shows the sequence of events during the selection of individual GWEN sites. Figure A.2 of this EA describes the screening process used during the field investigation to choose the candidate GWEN sites (CGSs). The environmental siting criteria applied in the site selection process are defined in Tables 5-1 and 5-2, pages 5-7 through 5-14 of the FEIS.



*IICEP = Interagency/Intergovernmental Coordination for Environmental Planning.

FIGURE A.1 GROUND WAVE EMERGENCY NETWORK SITE SELECTION PROCESS

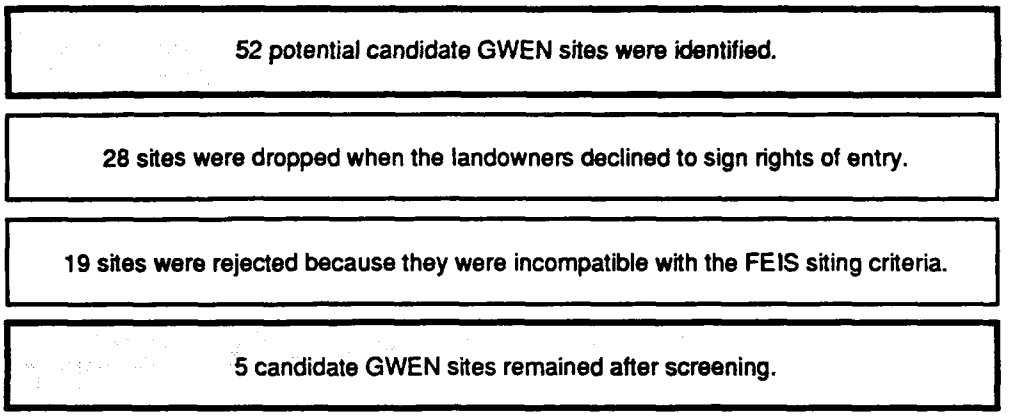


FIGURE A.2 RESULTS OF USING FEIS SITING CRITERIA TO SCREEN POTENTIAL CANDIDATE GWEN SITES IN THE NORTHWESTERN INDIANA SITE SEARCH AREA

APPENDIX B

TOPOGRAPHIC SETTINGS OF CANDIDATE GWEN SITES

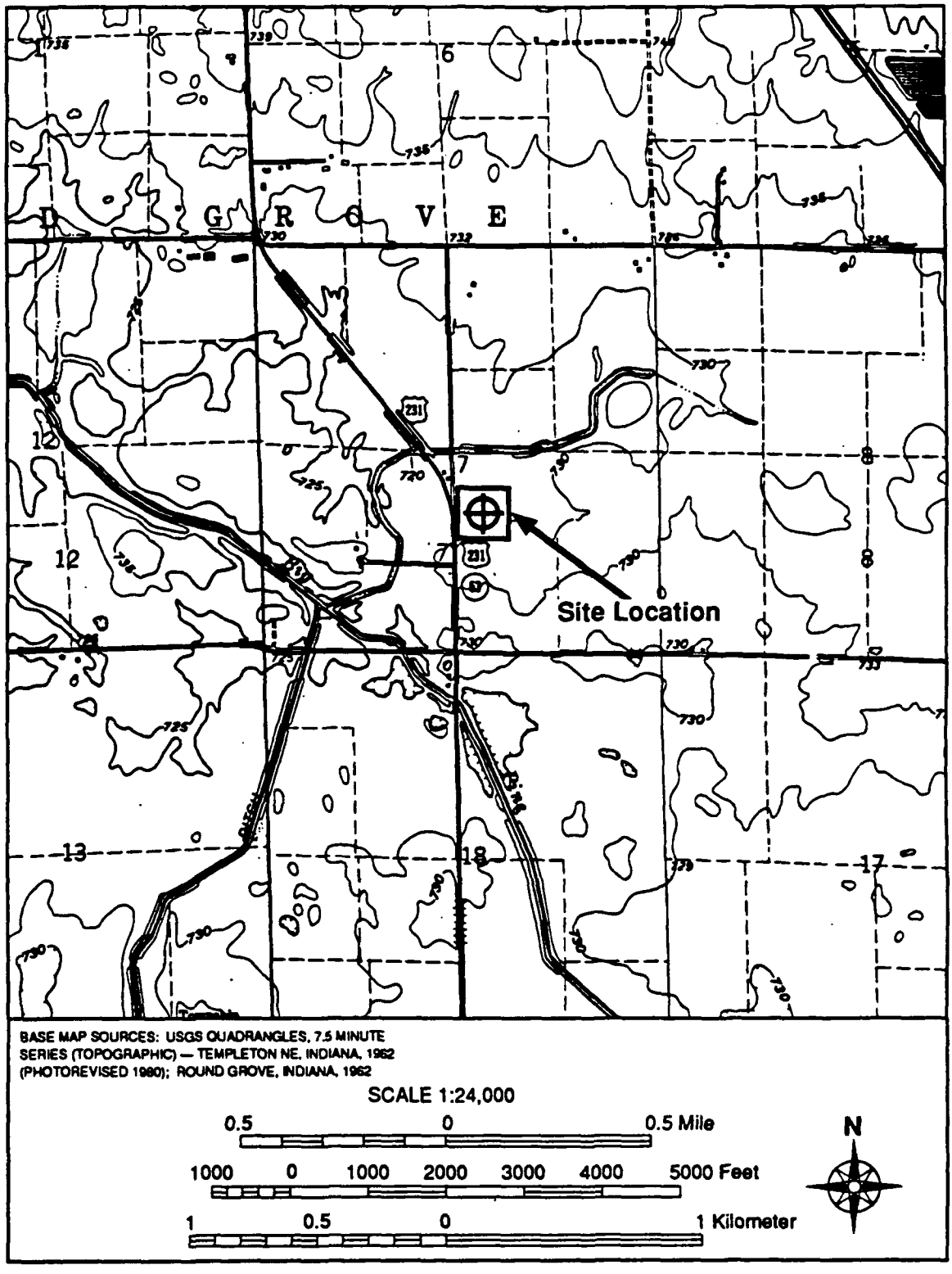


FIGURE B.1 TOPOGRAPHIC SETTING OF THE LEADER SITE (CGS-11)

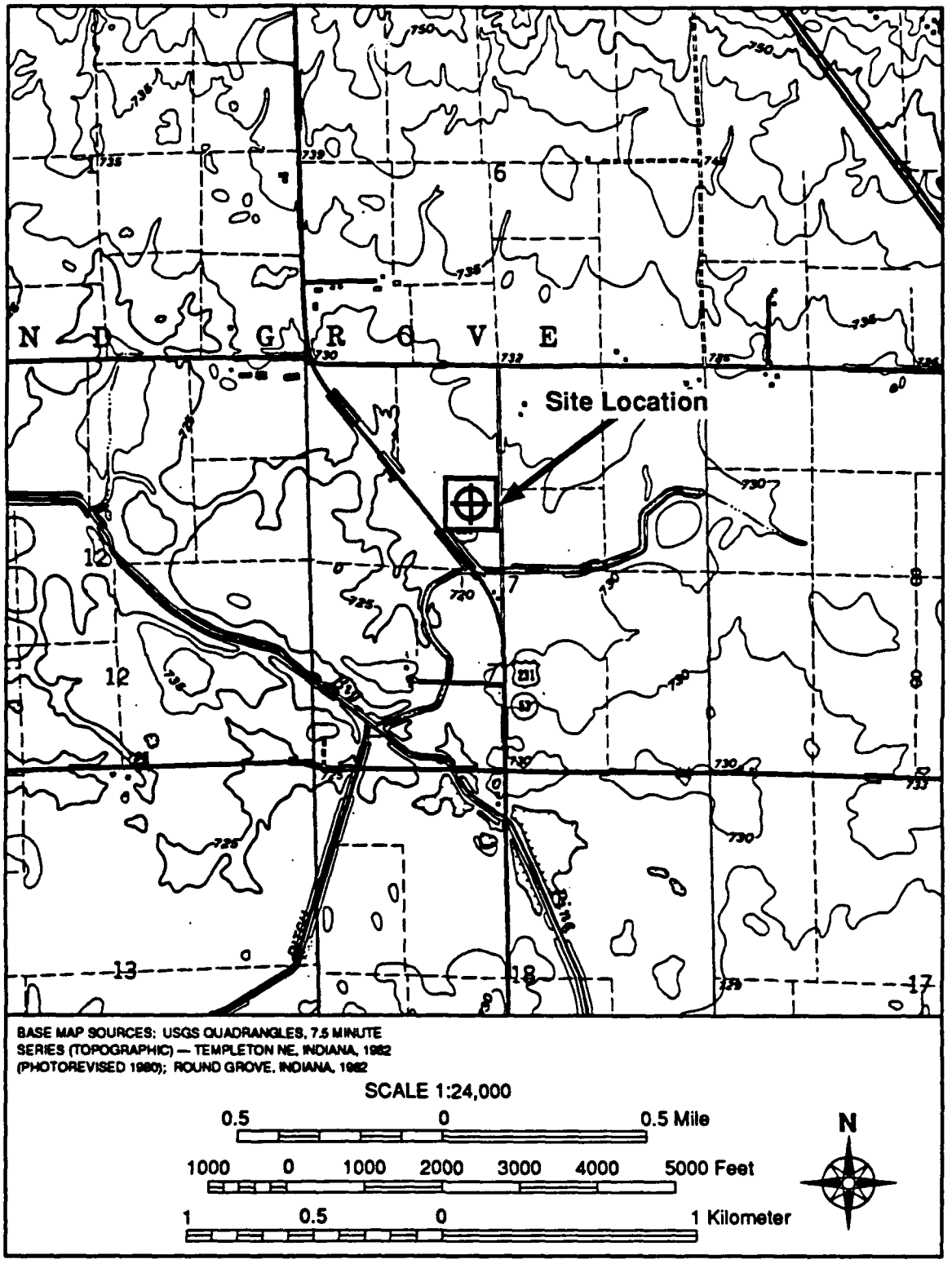


FIGURE B.2 TOPOGRAPHIC SETTING OF THE RATCLIFF SITE (CGS-12)

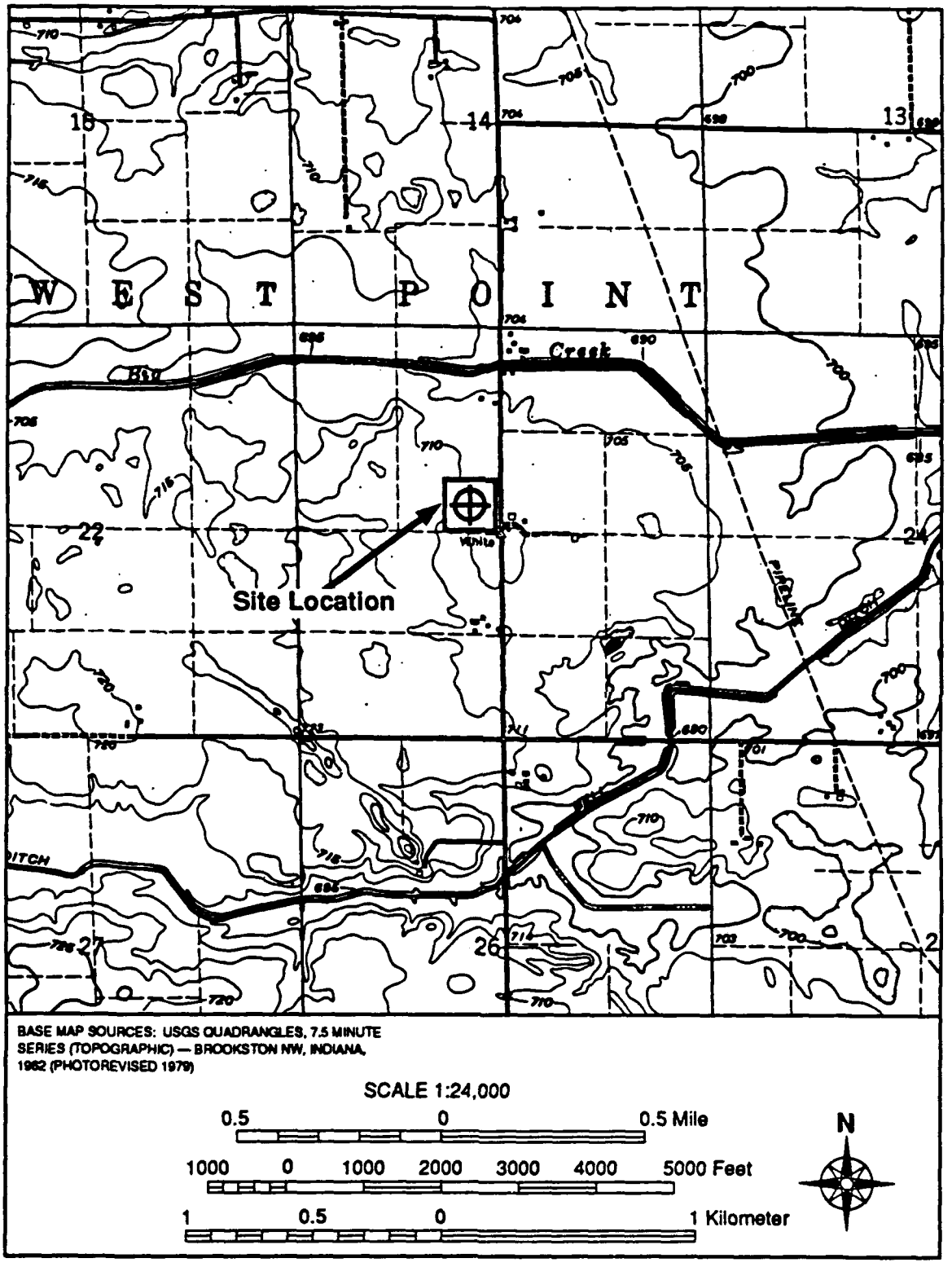


FIGURE B.3 TOPOGRAPHIC SETTING OF THE SANBLOOM SITE (CGS-26)

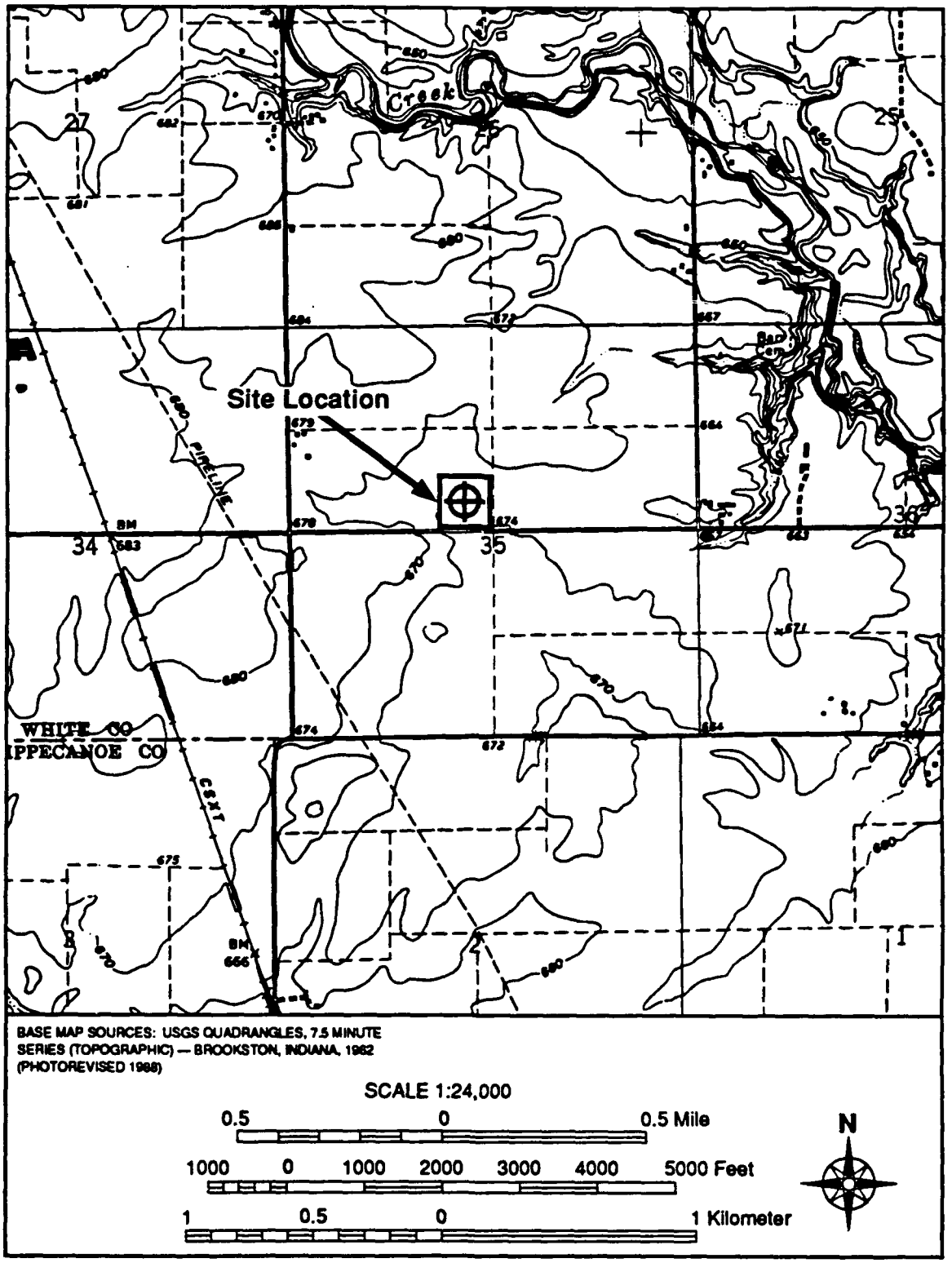


FIGURE B.4 TOPOGRAPHIC SETTING OF THE WARD SITE (CGS-33)

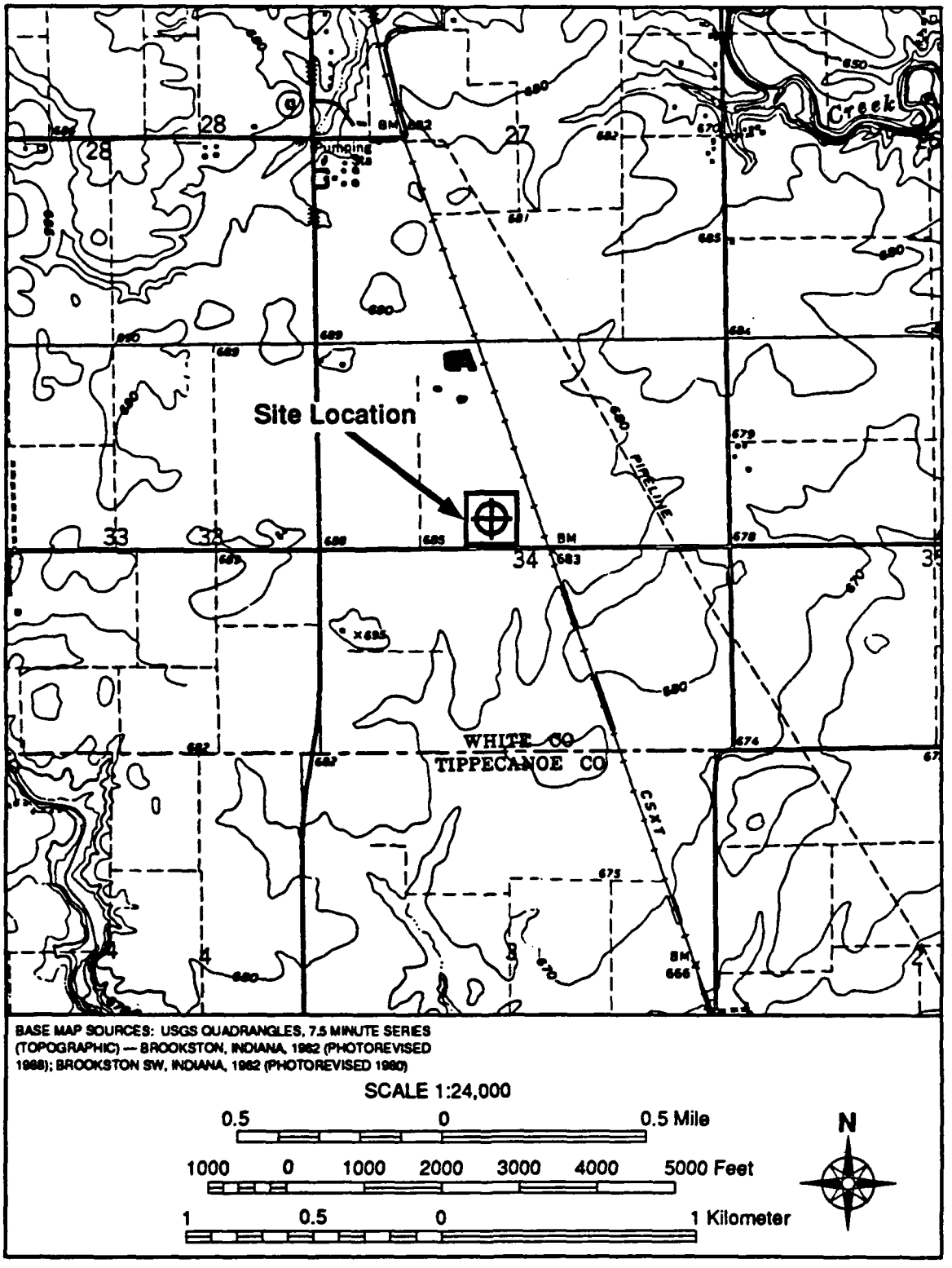


FIGURE B.5 TOPOGRAPHIC SETTING OF THE LEHE SITE (CGS-36)

APPENDIX C

CORRESPONDENCE

CORRESPONDENCE

Appendix C documents contacts with the following federal and state agencies and Native American groups:

Individual Contacted	Agency	Date	Response
David C. Hudak, Field Supervisor	U.S. Department of the Interior, Fish and Wildlife Service	02-28-90 06-21-90 05-12-92 12-29-92	Attached Attached Attached Attached
Patrick R. Ralston, State Historic Preservation Officer	Indiana Department of Natural Resources, Division of Historic Preservation and Archaeology	07-13-90 03-08-91	Attached Attached
R. C. Miller, Tribal Chairman	Stockbridge-Munsee Community, Bowler, Wisconsin	11-13-90	Attached
Jim Estes, Chief, Business Manager	Miami Business Committee, Miami, Oklahoma	Letter was sent 12-04-90. No response to letter or attempts at phone communication has been received.	
Charles Keechi, President	Delaware Executive Committee, Anadarko, Oklahoma	Letter was sent 12-04-90. No response to letter or attempts at phone communication has been received.	

Individual Contacted	Agency	Date Response
G. Captain, Chief	Eastern Shawnee Tribe of Oklahoma, Seneca, Missouri	Letter was sent 08-25-92. No written response but phone communication with P. Howser 09-24-92.
J. Edwards, Governor	Absentee-Shawnee Executive Committee, Shawnee, Oklahoma	Letter was sent 08-25-92. No response has been received to letter or several attempts at phone communication.
F. Leonard, Chief	Miami Tribe of Oklahoma, Miami, Oklahoma	Letter was sent 08-25-92. No written response has been received to the letter. Phone communication on 01-11-93.
J. A. Barrett	Potawatami Business Committee, Shawnee, Oklahoma	Letter was sent 08-25-92. No response has been received to letter or several attempts at phone communication.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
BLOOMINGTON FIELD OFFICE (ES)
718 North Walnut Street
Bloomington, Indiana 47401
(812)334-4261

IN REPLY REFER TO

February 28, 1990

Ms. Jill Buxton
Earth Metrics, Inc.
2855 Campus Drive, Suite 300
San Matro, California 94403

Dear Ms. Buxton:

This responds to your letter of February 16, 1990, requesting natural resource information as part of an environmental assessment for a proposed Ground Wave Emergency Network near Brookston, Indiana.

These comments have been prepared under the authority of the Fish and Wildlife Coordination Act (16 U.S.C. 661 et. seq.) and are consistent with the intent of the National Environmental Policy Act of 1969, the Endangered Species Act of 1973, and the U. S. Fish and Wildlife Service's Mitigation Policy.

Due to the large size the Site Search Area (250 square mile), the U.S. Fish and Wildlife Service can provide only the following information at this time:

Federal Lands

The project area contains no Federal lands

Endangered Species

The project area is within the range of the following Federally endangered species:

Indiana bat (Myotis sodalis)-this species uses caves in southern Indiana during winter and disperses throughout the state to reproduce and forage during spring and summer. Its preferred reproductive habitat includes moderate-sized, relatively undisturbed expanses of diverse mixtures of floodplain forest and upland forest. It is likely that such habitats exist within your project area.

Bald eagle (Haliaeetus leucocephalus). This species winters in Indiana; a pair nested and produced a chick in the state last year for the first time in over a century. None of the prime candidate sites for potential nesting are in your project area, however large water resources such as the Wabash and Tippecanoe Rivers and Freeman Lake must be considered potential nesting and/or foraging areas.

Fat pocketbook pearly mussel (Potamilus capax). This species' range includes the Tippecanoe and Wabash Rivers within your project area.

The project area is within the range of the following Federal candidate sp.

Carroll County

Kirtland's snake (Clonophis kirtlandii)
Eastern massassanga rattlesnake (Sistrurus catenatus)

Tippecanoe County

Eastern big-eared bat (Plecotus rafinesquii)

Wabash and Tippecanoe Rivers

Eastern sand darter (Ammocrypta pellucida)
Blue Sucker (Cycleptus elongatus)
fan-shell mussel (Cyprogenia stegaria)
northern club shell (Pleurobema clava)

Candidate status does not provide formal protection pursuant to the Endangered Species Act, but the presence of candidate species would be indicative of habitat quality and the need for additional mitigative measures. Candidate species may become listed in the near future.

Critical habitat

There is no critical habitat for Federally endangered species in the project area.

Wetlands and riparian areas

Due to the size of the project area, we cannot provide this information. The area spans several National Wetland Inventory (NWI) maps; these maps are available for inspection at this office and at all county Soil Conservation Service offices. The NWI maps can be purchased form the U.S. Geological Survey in Reston Virginia ((800) USA-MAPS).

Natural areas and State-listed species

This information can be obtained from the Indiana Department of Natural Resources.

Thank you for the opportunity to comment at this early stage of project planning. As alternate sites are selected, please contact us for additional coordination. For further discussion, please contact Mike Litwin at (812) 334-4268.

Sincerely yours,

Michael S. Litwin ACTING

for David C. Hudak
Supervisor

cc: IDNR, Division of Fish & Wildlife, Indianapolis, IN
IDNR, Division of Nature Preserves, Indianapolis, IN

United States Department of the Interior

IN REPLY REFER TO:

FISH AND WILDLIFE SERVICE
BLOOMINGTON FIELD OFFICE (ES)
718 North Walnut Street
Bloomington, Indiana 47401
(812)334-4261

June 21, 1990

United States Air Force
HQ Electronic Systems Division
Office of Public Affairs (ESD/PAM)
Hanscom, ABF, MA 01731-5000

Dear Sirs:

This responds to your 15 May 1990 Preliminary Evaluation Report concerning the 5 Candidate GWEN Sites (CGSs) in White County, Indiana. The U.S. Fish and Wildlife Service (Service) provided preliminary information in our letter of February 28, 1990.

These comments have been prepared under the authority of the Fish and Wildlife Coordination Act (16 U.S.C. 661 et. seq.) and are consistent with the intent of the National Environmental Policy Act of 1969, the Endangered Species Act of 1973, and the U. S. Fish and Wildlife Service's Mitigation Policy.

A biologist form the Bloomington Field Office reviewed the aforementioned sites for possible impacts to fish and wildlife on 18 June 1990. Concerning site selection, we recommend avoidance of site CGS-33 which contains a palustrine, emergent, temporarily-flooded wetland (Attachment A). Although no filling or draining of this wetland is proposed, it may be impacted indirectly by currently proposed or future site development.

Attachments B-D are taken from the White County Soil Survey. They indicate the presence of hydric soils on all 5 sites. Hydric soils are indicative of previous wetland conditions. Although ongoing agricultural operations are exempt from Section 404 permit requirements, undrained farmed wetlands again fall under Section 404 jurisdiction when farming ceases. Placement of fill in such areas may require a Section 404 permit from the U.S. Army Corps of Engineers. In many cases these areas will revert to wetland vegetation as soon as farming stops. We recommend that sites with the most extensive hydric soils (CGS 11 and 12) be avoided; such sites may also present difficulties for construction.

We recommend the following additional mitigation measures be included in the final project plans to minimize adverse impacts on fish and wildlife resources.

1. Implement temporary erosion and siltation control devices such as placement of straw bales in drainage ways and ditches, covering exposed areas with burlap, jute matting or straw, and grading slopes to retain runoff in basins.

2. Revegetate all disturbed soil areas immediately upon project completion.

ENDANGERED SPECIES

The proposed sites are within the range of the Federally endangered Indiana bat (Myotis sodalis) and bald eagle (Haliaeetus leucocephalus). These species would not be adversely effected by the proposed project at any of the five locations.

We appreciate the opportunity to comment at this stage of project planning. If project plans change such that fish and wildlife habitat may be affected, please recoordinate with our office as soon as possible. If you require additional information contact Ben Scherb or Mike Litwin at the Bloomington Field Office (812) 334-4268.

Sincerely yours,

David C. Hudak
Supervisor

cc: Federal Highway Administration, Indianapolis, IN
Director, Indiana Div.of Fish & Wildlife, Indianapolis, IN
Indiana Dept. of Environmental Management, Indianapolis, IN
Indiana Div. of Outdoor Rec., Indianapolis, IN
Director, Indiana Department of Highways, Indianapolis, IN

INDIANA DEPARTMENT OF NATURAL RESOURCES PATRICK R. RALSTON, DIRECTOR

Division of Historic Preservation
and Archaeology
251 East Ohio Street, Suite 880
Indianapolis, Indiana 46204
317-232-1646

July 13, 1990

Stephen T. Martin,
Lt. Col., USAF
Program Manager, GWEN
Department of the Air Force
Headquarters Electronic Systems Division
Hanscom Air Force Base, MA 0173-5000

Dear Lt. Col. Martin:

We have reviewed the five proposed Ground Wave Emergency Network (GWEN) relay node sites (DNR #4024) near Brookston in White County, Indiana.

No known historical or architectural sites listed in or eligible for inclusion in the National Register of Historic Places will be affected by this project.

A review of our records has revealed that very little archaeological investigation has yet been conducted in White County. In fact, only about 19 archaeological sites are currently recorded for the county, and none of the sites appears to be located within a mile of any of the proposed project area.

Based on soil characteristics and physiographic settings, however, we can offer the following comments pertaining to the potential for archaeological resources within the five project sites:

1. The locations for Towers 11 and 12 are in areas of poorly drained to very poorly drained soils and, based on our knowledge of aboriginal settlement in northwest Indiana, are unlikely to contain significant archaeological sites. Therefore, the proposed construction of towers 11 and 12 may proceed as planned on these locations. However, should artifacts or features (firepits, burials, etc.) be discovered during construction, work must stop and the discovery reported to the Division of Historic Preservation and Archaeology for evaluation.

2. The physiographic settings and better drained soils within tower locations 26, 33, and 36 indicate a potential for archaeological resources to occur within these project areas. Therefore, reconnaissance level archaeological surveys would be needed of these three locations in advance of construction.

We will need an archaeological reconnaissance level survey. The survey must be done in accordance with the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation (48 FR 44716). A description of the survey methods and results must be submitted to the Division of Historic Preservation and Archaeology for review before we can comment further. Please refer to the enclosed list of qualified archaeologists.

In the event that sites which are eligible for the National Register are discovered, the applicant must follow the rules and regulations established by the Advisory Council on Historic Preservation to implement federal Public Laws 89-665, 94-422, and 96-515, and Executive Order 11593.

We appreciate the opportunity to be of service.

Very truly yours,

Patrick R. Ralston
State Historic Preservation Officer

PRR:JAM:vk

Enclosure

INDIANA DEPARTMENT OF NATURAL RESOURCES
Division of Historic Preservation
and Archaeology
251 E. Ohio Street Suite 880
Indianpolis, Indiana 46204

PATRICK R. RALSTON, DIRECTOR

March 8, 1991

Steven M. Moore
Environmental Analyst
Earth Metrics Inc.
7000 Marina Boulevard, 4th Floor
Brisbane, California 94005

Dear Mr. Moore:

We have reviewed the Preliminary Site Evaluation Report, Phase I Archaeological and Architectural History Cultural Resource Survey and Visual Analysis Report for the five candidate Ground Wave Emergency Network (GWEN) relay node sites near Brookston in White County, Indiana (DNR #4024).

Of the two structures, the report identified as potentially eligible for inclusion in the National Register of Historic Places (schoolhouse, WP-011, and pratt-thru-truss bridge, P-014), it is our opinion that only the West Point schoolhouse is eligible for the National Register. This one-room, frame schoolhouse is eligible under Criterion A and, as well, retains good architectural integrity. Considering the schoolhouse's distance from the proposed candidate GWEN site CGS-26, we believe that the placement of CGS-26 would have no effect on the qualities that have made this historic property significant.

Bridge #228 (P-014) was originally a state highway bridge that was moved to its current location on CR 100 East approximately twenty years ago. Based on the results of the comprehensive inventory of metal bridges built from 1870 to 1930 in Indiana, which were published in Iron Monuments to Distant Posterity-Indiana's Metal Bridges, 1870-1930 by James L. Cooper, Ph.D., it is our opinion that Bridge #228 (P-014) does not meet the criteria for inclusion in the National Register. None of the other sites inventoried in the report is eligible for the National Register.

Regarding archaeological resources, we believe that no known archaeological sites listed in or eligible for inclusion in the National Register would be affected by this project. If any

archaeological artifacts are uncovered during construction federal law and regulations (16 USC 470, et seq.; 36 CFR 800.11, et al.) and, additionally, state law (Indiana Code 14-3-3.4), require that work must stop and that the discovery must be reported to the Division of Historic Preservation and Archaeology within two (2) business days.

If you have any questions, please do not hesitate to contact Sue Becher Gilliam at 317/232-1646.

Very truly yours,

Patrick R. Ralston
State Historic Preservation Officer

PRR:SBG:vk

STOCKBRIDGE · MUNSEE

BAND OF MOHICAN INDIANS

STOCKBRIDGE - MUNSEE COMMUNITY

Route 1 Phone Bowler (715) 793-4111

BOWLER, WISCONSIN 54416

November 13, 1990

Attn: Steve Moore
Earth Metrics Inc.
2855 Campus Dr.
Suite 300
San Mateo, CA 94403

Dear Mr. Moore,

In regard to your letter of October 31, 1990, the Stockbridge-Munsee has consulted with our historical archives department pertaining to your request.

The Stockbridge-Munsee people did indeed spend some time in Indiana between the years 1818 - 1822, as they were promised land near the White River. Upon arrival in the area from New York, they found the land was not available so had to "camp" there until new lands could be found.

This White River area was near Muncie and Indianapolis, so appears to not be in the area with which you are concerned. We suggest thtat the Delaware Indians may be very interested in the area, however, as that Tribe was living in the area prior to our Tribe's sojourn.

We hope this is helpful to you project.

Sincerely,

R.C. Miller
Tribal Chairman

United States Department of the Interior

FISH AND WILDLIFE SERVICE
BLOOMINGTON FIELD OFFICE (ES)
718 North Walnut Street
Bloomington, Indiana 47404
(812) 334-4261 FAX 334-4273

IN REPLY REFER TO:

May 12, 1992

Lt. Colonel Stephen Martin
Department of the Airforce
Headquarters Electronic Systems Division
Hanscom Air Force Base, Massachusetts

Dear Colonel Martin:

This responds to your letter of April 23, 1992, requesting updated endangered species information for the GWEN project in Northwestern Indiana.

Our letter of February 28, 1990, included endangered/threatened/candidate species information for numerous prospective sites in several counties. Since the list of prospective sites has now been reduced to 5 sites, all in White County, some of that previous information is no longer relevant. As stated in our subsequent letter of June 21, 1990, the 5 sites are within the ranges of the Federally endangered Indiana bat and bald eagle. The list of Federally endangered mussels which inhabit the Wabash River and Tippecanoe River in your project area should be expanded to include the tubercled-blossom pearly mussel (Epioblasma torulosa torulosa) and the fanshell mussel (Cyprogenia stegaria). Since none of the 5 sites involves impacts to the aforementioned rivers, the project is not likely to adversely affect these mussel species.

For further information, please contact Mike Litwin at (812) 334-4268.

Sincerely yours,

David C. Hudak

David C. Hudak
Supervisor

cc: Director, Indiana Division of Fish & Wildlife, Indianapolis, IN
IDNR, Division of Outdoor Recreation, Indianapolis, IN
IDEM, Division Water Management, Indianapolis, IN

United States Department of the Interior

FISH AND WILDLIFE SERVICE
BLOOMINGTON FIELD OFFICE (ES)
718 North Walnut Street
Bloomington, Indiana 47404
(812) 334-4261 FAX 334-4273

IN REPLY REFER TO:

TAKE PRIDE IN AMERICA

December 29, 1992

Mr. Stephen Martin, Lt. Col., USAF
Headquarters Electronic Systems Division
Hanscom Air Force Base, Massachusetts

Dear Mr. Martin:

This responds to your letter of December 17, 1992, requesting an updated federal list of endangered/threatened species for the Air Force's GWEN project site in White County, Indiana.

These comments have been prepared under the authority of the Fish and Wildlife Coordination Act (16 U.S.C. 661 et. seq.) and are consistent with the intent of the National Environmental Policy Act of 1969, the Endangered Species Act of 1973, and the U. S. Fish and Wildlife Service's Mitigation Policy.

The endangered species information provided in our letter of May 12, 1992 is still accurate for the project site; there have been no additions of species or status changes for previously-listed species in White County.

Thank you for your inquiry in this matter. If new information regarding endangered/threatened species becomes available relevant to the GWEN project we will provide additional coordination. For further discussion please contact Mike Litwin at (812) 334-4268.

Sincerely yours,

David C. Hudak
Supervisor

cc: Director, Indiana Div. of Fish & Wildlife, Indianapolis, IN
Indiana Dept. of Environmental Mgt., Bradbury, Indianapolis, IN
Indiana Div. of Outdoor Rec., Indianapolis, IN

APPENDIX D

GLOSSARY

GLOSSARY

Abbreviations and Units of Measure

AM	Amplitude Modulation
ATU	Antenna tuning unit
BIA	Bureau of Indian Affairs
BUPG	Back-up power group
CGS	Candidate GWEN site
dBA	Decibels on the A-weighted scale, which is a measure of the intensity of the sounds people can hear
EA	Environmental Assessment
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FEIS	Final Environmental Impact Statement; in this document, the term refers to the FEIS for the GWEN Final Operational Capability that was released in September 1987 by the U.S. Air Force, Electronic Systems Division, Hanscom Air Force Base, Massachusetts
FIA	Federal Insurance Administration
FICWD	Federal Interagency Committee for Wetland Delineation

FOC	Final Operational Capability, the third phase of development of GWEN
FONSI	Finding Of No Significant Impact
GWEN	Ground Wave Emergency Network
HEMP	High-altitude electromagnetic pulse
IAC	Indiana Administrative Code
IDH	Indiana Department of Highways
IDNR	Indiana Department of Natural Resources
IICEP	Interagency and Intergovernmental Coordination for Environmental Planning, the formal review process for the EA
kHz	Kilohertz
LF	Low frequency
mg/l	Milligrams per liter (1 mg/l = 1 ppm)
MM	Modified Mercalli, a scale of the severity of earthquake effects
µg/l	Micrograms per liter (1 µg/l = 1 ppb)
NRC	National Research Council, the principle operating agency of the National Academy of Sciences and the National Academy of Engineering

NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
PAWS	Potential areawide sites; the portion(s) of an SSA left after application of those siting criteria that do not require a field survey, such as the location of national and state parks
PCGS	Potential candidate GWEN site; any site that is identified from roadside surveys as suitable for further investigation
PGS	Preferred GWEN site; the CGS identified by the Government that represents the Government's preferred location for a relay tower
ppb	Parts per billion
ppm	Parts per million
PSER	Preliminary Site Evaluation Report
SCS	Soil Conservation Service, a unit of the United States Department of Agriculture
SHPO	State Historic Preservation Officer; the person responsible for administering the National Historic Preservation Act at the state level, reviewing National Register of Historic Places nominations, maintaining data on historic properties that have been identified but not yet nominated, and consulting with federal agencies concerning the impacts of proposed projects on known and unknown cultural resources

SSA	Site search area; the 250-square-mile area within which four to six CGSs are identified; the SSA is the area within a 9-mile radius of a set of nominal coordinates in the network design. It is used as a manageable range in which to conduct siting investigations.
TLCC	Thin Line Connectivity Capability; the second phase of development of GWEN
UHF	Ultrahigh frequency (band); specifically 300 to 3,000 megahertz
USAF	United States Air Force
USC	United States Code
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VMC	Visual Modification Class
WCHS	White County Historical Society
WPA	Works Projects Administration

Definitions

Air pollutant	An atmospheric contaminant, particularly the 15 atmospheric contaminants specified in federal and most state regulations
Alluvial	Pertaining to loose river sediments, such as clay, silt, sand, and gravel

Anaerobic	Occurring in the absence of free oxygen
Archaic	Characteristic of a more primitive time
Avian	Pertaining to birds
Candela	A unit of measure of the intensity of light equal to the brightness of one candle
Cultural resource	Prehistoric, Native American, and historic sites, districts, buildings, structures, objects, and any other physical evidence of past human activity
Evaluative criteria	Applied to portions of a potential siting area for a GWEN facility to determine its suitability. Areas that rank low against evaluative criteria may be excluded from consideration, or given a low priority in the site selection process
Exclusionary criteria	Criteria used to eliminate or exclude highly sensitive areas or areas that do not meet the limits of acceptable performance from consideration for GWEN facilities
Farmed wetland	A wetland that was partially drained or altered to produce crops prior to December 23, 1985. The land was not completely drained or has seasonally flooded areas that still meet wetland criteria

Federal jurisdictional wetland	As defined in the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands* (GPO 1989-236-985/00336), a wetland is a class of habitats distinguished by the presence of saturation to the surface or standing water during at least 1 week of the growing season (wetland hydrology), a soil type characteristic of saturated or poorly drained conditions (hydric soils), and the predominance of plants that only or mostly occur on wet sites (hydrophytic vegetation)
Floodplain	Land adjacent to a river that is commonly covered by water during high flow periods
Glacial till	Unsorted and poorly sorted sediments deposited by melting glaciers
Ground plane	A part of the antenna system consisting of buried copper wires that extend radially from the base of a GWEN tower for a distance of approximately 330 feet
Historic properties	For purposes of this EA, historic properties are those aboveground structures and resources that are listed, or eligible for listing, on the National Register of Historic Places
Hydric soil	A soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part

Modified Mercalli scale	A measure of the intensity of seismic activity based on human perception of the event and potential for damage; the intensity is rated on a Roman numeral scale ranging from I to XII. An earthquake of MM intensity I would be detectable only by seismographs; MM intensity V would shake buildings, break dishes and glassware, and cause unstable objects to fall; MM intensity X would destroy most masonry and frame structures, bend railroad rails slightly, and cause tidal waves and landslides; MM intensity XII would cause nearly total destruction of all buildings. Another commonly used seismic intensity scale, based on readings from a seismograph, is the Richter scale, which was developed in 1935. The Modified Mercalli scale is often used when the historic period to be covered includes data prior to 1935
Moraine	An accumulation of earth and stones carried and finally deposited by a glacier
Mound Builders	A member of a prehistoric American Indian people whose extensive earthworks are found from the Great Lakes down the Mississippi valley to the Gulf of Mexico
Paleonto-logical	Pertaining to fossils or the study of fossils
Paleozoic era	A geologic period of time from 590 million to 248 million years ago
Palustrine wetland	An interior wetland with emergent vegetation
pH	A measure of acidity in which the lower the number, the more acid the substance; 7 represents neutrality

Phase I survey	A survey designed to identify properties that are listed, eligible for listing, or potentially eligible for listing on the National Register of Historic Places within the area that would be affected by the proposed project
Plat	Plan, map or chart of a piece of land with actual or proposed features (such as lots)
Prime farmland	Land that contains soils having high crop production either naturally or through modification; the U.S. Soil Conservation Service is responsible for designating prime farmland
Raptor	Bird of prey, such as hawk, eagle. and owl
Sedimentary rock	Rock formed by the consolidation or cementation of particles deposited by water or wind
Staging area	A traditional stopover point for migratory birds
Top-loading element	Portions of the GWEN antenna that extend diagonally from the top of the tower, which strengthen the signal and provide additional structural support like guy wires